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An Address.[1]

THE PHYSICIAN, HIS LIFE AND TIMES.[1]

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Montaigne has said that he who praises himself detracts from his subject, and there seems to be unanimity in the view that men are partial judges of themselves. Therefore, it does not seem meet that a physician should praise the physician. Nor is it necessary, because this has been done by others, by men famous in letters and public affairs, who have described his virtues, his standards, his humanity, his generosity and his public spirit with an eloquence and authority which no mere physician can command. But no one can speak more properly than a physician of his work and of its influence, of its traditions and history, of its variety and fascination, of its usefulness and dignity.

The physician's work has traditions which reach back to earliest history. It ranks with astronomy as the oldest learned profession, and its written records go back almost as far as those of its sister, science. It has a more continuous history than other branches of learning, and in contrast with these it has enjoyed in the western world an almost apostolic succession since the days of ancient Greece. It has persisted throughout the centuries, always with the prerogatives of an organized body, possessing its own literature, retaining a position of outstanding cultural importance and preserving its high place in the esteem of men.

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[1] Delivered at the annual meeting of the Royal Australasian College of Physicians at Melbourne on March 24, 1939.

In ancient Egypt the priest-physician stood lower only than the king. In the intellectual aristocracy of Greece, when reason ruled the world, he was among the world's rulers. In mediæval times his social background changed. In that period, which saw the decay and disruption of empires, the disorganization of society and the submersion of knowledge and truth by dogma and superstition, the physician, with the astronomer, kept alight the meagre flame of natural knowledge in the Christian world. He retained, even in times of religious intolerance, that confidence which could outweigh the handicap of being pagan or heretic. In the words of a recent scholar:

Whatever circumstances contribute to the almost superstitious reverence which the profession of healing has managed to attach to itself and to retain, its existence is hardly a matter of dispute.

The reason surely lies hidden in the very nature of the physician's work and in the influence which he has had on his times in every epoch.

The only things of value which have come down to us from those early days are traditions and principles. Indeed, the sayings of Hippocrates are household words today. The real distinction between ancient and modern medical science is a distinction of content rather than of method. We derive none of our conceptions of life, its beginning and its end, from the ancients. Their physiology and pathology were fantastic and to them we owe nothing. The ancient prescriptions from classical and Moorish pharmacopœias were pure quackery. Their single achievement which has been handed on as a legacy is the substance calomel, which was known to the Egyptians; and if the achievements of the physician have been less conspicuously successful in other fields, there is no doubt of the gratitude of their fellows for this and other lowly substances of similar nature, for it was expressed in lyrical and rapturous descriptions, only equalled in our day by the words of the announcer of an advertising radio station.

But in spite of these things, medicine in that period between ancient Greece and the seventeenth century lived and grew in strength because, although it appeared to be stagnant in its additions to knowledge, there was a great force operating, laying the foundation of things which now form some of the greatest social institutions of our times.

We may trace the growth of European medicine, as we understand the term today, to the hospitals of the monastic orders and to the medical schools of the ecclesiastical universities. We must clearly recognize that Catholic Christianity, through the two great orders of the Benedictines and Franciscans, laid the traditions of the care of the sick and the needy with great philanthropic ardour, and their hospitals and medical schools, showing remarkable tolerance in their encouragement of the Jewish and Moorish physicians, protected natural knowledge from the blight which threatened to extinguish it.

The hospital of the modern world rests on the foundations of this mediæval system, which made orderly and continuous medical study possible for the first time in history. A large proportion of the noblest hospitals of today exist by uninterrupted descent from monastic charities. There are two instances which will come to English people's minds at once: Saint Thomas's Hospital, on the banks of the Thames, is the continuation of a monastic charity of the thirteenth century; and Saint Bartholomew's Hospital, in the very heart of the city of London, is of even earlier origin. Once the monks took unto themselves the task of succouring the sick and needy, medical care ceased to be the prerogative of the well-to-do. It was given to all, rich or poor; and to this single fact more than to any other the growth of medical science is due. "Science as a whole owes a great debt to the high valuation of human life."

There are many other evidences of the beneficent influence of the work of these enlightened men, but I shall mention only two.

Although the art of gardening had attained a high level in the civilizations of Mesopotamia and Egypt, and later in Persia, in mediæval Europe the only real gardens were those of the monasteries, and these included, as a necessary part, the physic garden. A monastery physic garden was thought necessary for the healing of the sick. The study of herbs became an important part of the training of the physician, and there arose a closer union between the practice of medicine and the study of Nature. In this way the systematic study of botany arose. Founded as it was upon exaggerated and sometimes fantastic belief in the curative powers of herbs, botany may be said in one sense to have led the physician down the garden path; but, although hopes ultimately proved illusions, from these beginnings, that great science developed which eventually taught us much of what we know about the physiology of growth, reproduction and inheritance. In later days, with the rise of chemistry, the physician came to use pure substances and the use of herbs has long since ceased among educated people. But tradition dies hard, and there are still some in every community who have a superstitious belief in the power of herbs, especially, it appears, if dispensed by an Asiatic of doubtful cleanliness.

Another debt we owe to the religious physicians. To them may be attributed, if not the invention, certainly the general use of spectacles. Although devices of one kind or another for magnifying objects are of considerable antiquity, they do not appear to have been in general demand until these early physicians introduced them for the help of "poor blind men". "Medical solicitude sponsored the spectacle trade, which in turn revived optical science." Interest in optics nursed the microscope, the instrument which above all others has made possible the modern study of disease and infection.

Such, then, are the beginnings of modern medicine. The stream of knowledge dammed up for a thousand years began to flow again three centuries ago, and

it has gained momentum ever since, until now it is a veritable torrent. Whatever doubts we may sometimes feel in a troubled world, whatever the hates and jealousies, the lies and betrayals, the cruelties and intolerances, it is true that a scientific outlook is characteristic of our civilization in contrast with the civilizations of antiquity.

The story of the development of the art of healing is not a simple story, since it is interwoven with that of every other branch of physical and biological science. In undertaking the description of the most important achievements in medicine in its later growth, one is embarrassed by the abundance of the material of choice, and by the difficulty of making a just distinction between those discoveries which strike the imagination by their novelty and their immediate usefulness, and those unobtrusive and pregnant observations in which the germ of the great things of the future really lie.

It has been said that all the thoughts of men from the beginning of the world till now are linked together in one great chain. Huxley used a different metaphor. By him knowledge was compared with an enormous tree with the leaves, flowers and fruit upon the innumerable branches of a few great stems fed by commingled and hidden roots. These stems bear the names of a few men endowed with intellects of heroic force, and to these stems we are led inevitably when we trace every twig backwards, no matter at what point we start. To assign names to the main stems of the tree of medical knowledge is a task of great complexity and fascination; but some of the great branches through which the sap has flowed to form and nourish the twigs and leaves of this luxuriant tree stand out clearly.

It is possible to recognize with certainty that underlying all our conceptions of health and disease are Harvey's discovery of the circulation of the blood and Schleiden and Schwann's demonstration that all animal and vegetable bodies are vast collections of cells floating in fluid. We must pay tribute to the biochemist Liebig, who founded what he called "the beautiful and useful science" which tells us of the chemical changes of life, and to Claude Bernard, that great experimentalist, from whom came the foundations of modern physiology. Another stem name is Pasteur, who dealt the final blow to the Aristotelean theory of spontaneous generation, discovered microorganisms and their relationship to disease, and laid the foundations which led, in the years 1890 to 1900, to the full development of modern bacteriology and immunology. And the list grows with the discovery of enzymes, of hormones, the physiological messengers of the body, of the effects of radiant energy, of vitamins, the extraordinary accessory food factors and diseases arising from their lack, and of the artificial manufacture of organic matter. Indeed it is difficult to leave this subject with a list so incomplete; but I am aware that every specialist in this audience is burning to add to it, every one, no doubt, with justification.

These men whose names we honour sought truth with no other object than finding it. The great steps in the progress of medical science have been made for the most part by men who sought knowledge simply because they craved for it. Their labours were not usually directed to merely utilitarian ends or practical triumphs. And there is no doubt that in all ages they have had their detractors, as those who pursue knowledge for its own sake have today. The great Harvey himself was not free from the criticism that his work had no practical value, and there are many in our time, ignorant of history and hopelessly myopic, who decry the work of those who are adding to the stores of knowledge because it is not producing immediate results in the cure and prevention of disease. These fruits come sooner or later, because all new discoveries ultimately influence the treatment of sick people, which is the end and justification of the physician's existence. But as it has been expressed by one of our greatest writers, by the time the practical results can be seen, "the crest of the wave of investigation is far away on its course over the illimitable ocean of the unknown".

But while we honour the names of the great leaders and integrators, the generals, let us not forget the vast multitude of patient toilers, the unknown soldiers of the fight against human suffering.

A recent scholar has discussed, as if it were a mystery, the development of the profession of medicine, its history, its persistence, its recent enormous growth, and the tribute it has levied on the physicist, the mathematician, the chemist, the biologist, the economist and the philosopher. Inappropriately he has applied the technique of crime detection. He has sought the opportunity, the means and the motive.

The opportunity is there always, and has been ever since the time when the medical profession has concerned itself with all human beings. It is at hand always in the care of disease and its prevention, whether by the doctor in his patient or by the State in its citizens. The physician has not let opportunity go by when crumbs were falling from other scientific tables. Like Kipling's Homer, "What he thought he might require, he went and took"; and with this help, and from the great advance in modern times of the development of the machinery and apparatus of investigation, he has acquired the means by which progress has been made possible.

We have already mentioned the invention of the microscope, which provided a free pass to a totally unexplored universe, gave an insight into the facts of reproduction in plants and animals and a close-up view of the basis of inheritance, and played its part in the discovery of germs or microorganisms. Also from the physicist, among many other contributions, we recognize the gift of the thermometer, the means for observing the behaviour of gases and solutions, the manifestations of energy, the thermodynamic laws and electrophysics.

Chemistry, once it emerged from alchemy and turned from the firmaments to the minor affairs of this world, taught us the dependence of animal and plant, the carbon-nitrogen cycle, respiration and combustion, and gave us the preparation of pure substances, which are the foundation of all modern medicinal treatment. It has helped us past the herbs and past the stage of the treatment of symptoms to the treatment of causes. Among its multitude of gifts are anæsthetics, old and new, the alkaloids, arsenic and the sulphanilamides.

The third criterion of detection is that of motive. What are the activating forces in this profession, which call ordinary men with a voice which brooks no denial and which binds them together so closely, irrespective of race or colour or creed? These forces are easy to discern. The physician's life in our times has the fascination of a life of constant variety. This comes from ceaseless extension of the knowledge of old and new diseases and from the changing characters of diseases themselves. Indeed, the more our knowledge increases, the more we ponder not on why people die, but on how they manage to live. I think it was Robert Louis Stevenson who said "true health is to be able to do without it".

A survey of modern medicine reveals a story of continual progress; but its advance was by occasional and irregular steps until about sixty years ago, when there came an extraordinary outburst of activity in the medical sciences, which, when its influence was felt in practice, accelerated the rate beyond all previous experience. Since then, in the last few decades, within the memory of living men, more outbursts have occurred than in the centuries preceding them.

Before the effect of one impulse waned another had appeared and the speed increased. It may be said that medical knowledge had changed suddenly from a single-cylinder to a multicylinder method of progression. Every new phase of activity began with a discovery of fundamental importance, and its influence spread widely, even backwards, and far beyond the immediate problem that was the subject of investigation. For example, when the secret of pernicious anæmia was revealed to a group of American investigators about thirteen years ago, not only was the treatment of this disease transformed and despair gave way to hope, but a great impetus was given to the understanding of the blood in its development and behaviour under all conditions, and new light was thrown on the role of the food and on many problems of nutrition.

The work of Pasteur made a new world for surgeon and physician. It made modern surgery and profoundly affected modern medicine, because it revealed the cause, previously hidden, of a multitude of diseases. Indeed it seemed at that time that all remaining problems of the causes of disease had been solved. They were believed to be due to the enemy from without. The successes of bacteriology and immunology are familiar to those with even a slight knowledge of modern surgery and infectious disease.

Sir Henry Dale contrasts the state of mind sixty years ago, when the father at family prayers said "Protect us, O God, from diphtheria", and when suspicion of faulty drains represented the highest flight of medical speculation regarding the cause of that disease, with that state of mind in many enlightened communities today, in which, as the result of immunization of school children, diphtheria has ceased to count as a threat to their child life.

But all new things in medicine have their disappointments as well as their successes.

As knowledge of infectious diseases grew it became apparent that the enemy from without did not explain the cause of all those diseases to which it seemed at first to supply the key. Disappointment was short-lived because of the discovery of the enemies from within. These are the deficiencies, the lack of substances normally present within the body, derived from hitherto unrecognized activities of various organs and from the food. Twenty years ago we were wondering if these unobtrusive substances had any real existence. Today many of them can be structurally identified and some even manufactured by the chemist.

Who would have ventured twenty years ago to suggest that the time was at hand when by making good the appropriate deficiency, rickets could be abolished from the children of a modern city, and the sufferers from diabetes or pernicious anæmia be enabled to live almost normal lives?

Not only are old diseases yielding their secrets, but new ones are being recognized. Some are recognized through better diagnostic skill no doubt; but others are due to novel types of infection, so late in the history of a crowded planet as the twentieth century, by contact with germs long established in insects and wild animals. Within the course of less than twenty years at least three new severe virus diseases have been recognized. I do not wish to imply that the physician rejoices that new diseases arise to cause suffering and death, but rather to point out that his work is full of the interest that comes from change.

It is satisfactory to ponder that on the other side of the ledger maladies previously more widespread and dangerous than the new ones have disappeared or are disappearing rapidly.

The effect of these advances on the times is of enormous significance, not only in the diminution of human suffering, but in its economic bearing. Three hundred years ago the average length of human life in England was thirty years. Today it is sixty-one years. Of a thousand babies born in England in Bacon's time, about three hundred normally died in their first year. Last year in Australia only thirty-eight died.

In the world of living things nothing, not even disease, is static. Old diseases vanish, new ones arise, and those which persist change slowly or quickly. The mutual relations of seed and soil,

germ and host, undergo gradual adaptive changes, hygiene and sanitation improve, and possibly the altered conditions and problems of modern life also play their part.

It is well known that the common and great infections are changing in their characters and virulence, and others, which are among the minor curses of civilization, change their lineaments from year to year.

In epidemic diseases the seed and the soil are the most important factors. A striking example of the influence of the lack of adaptation between seed and soil is provided by the introduction of measles into Fiji, following the visit of the king of these islands and his son to Sydney in 1875. It caused the death of 40,000 people in a population of 150,000. Yet measles is a mild disease in communities which have become adapted naturally to it.

And it is not only in diseases due to infection that change is obvious. For reasons we know not of, many common ailments increase in frequency and disappear, take on new characters and shed old ones from decade to decade. It is an interesting speculation that an altered social background may be playing a big part in this.

But more important than the fascination of change and variety, there is a deeper force actuating those who practise medicine. It is expressed in the motto of the Royal Australasian College of Physicians: *"Hominum servire saluti"*—"To serve the welfare of mankind". Physicians have sometimes been said to arrogate to themselves an ethic superior to that of other people. This unjust accusation is due largely to those popular writers of sentimental fiction who love to invest the doctor with an aura of nobility.

A distinguished bacteriologist has protested against this tendency, pointing out that when one of his colleagues dies, "as other people do—of incidental dissipation, accident or old age, devotion and self-sacrifice are the themes of the minister's eulogy. Let him succumb in the course of his work—as an engineer falls down a hole or a lawyer gets shot by a client—he is consecrated as a martyr. Novelists use him as they formerly did cavalry officers, Polish patriots or aviators."

No, the doctor in our time has the same social context as lawyer or engineer, professor or politician, merchant or mechanic, artist or artisan, and, like them, has his weaknesses, his follies, his vanities and his rivalries. But the common man who studies and practises medicine gains something from it which distinguishes him, whether he be a scientist in the laboratory or a scientist at the bedside. He who does not receive from it some kindling of unselfishness and some urge to knowledge is of common clay indeed. Few there are who are so blind to tradition and so deaf to the call of those who suffer and are in need that they are not touched thereby to a greater tolerance and a greater humanity. And the material advantages that medicine yields never have been and never will be the main attraction of its votaries.

That which stirs their pulses is the love of knowledge and the joy of the discovery of the causes of things sung of by the old poet—the supreme delight of extending the realm of law and order ever farther towards the unattainable goals of the infinitely great and the infinitely small, between which our little race of life is run.

ON COMPULSIVE GRASPING, THE GRASP REFLEX, TONIC INNERVATION AND ASSOCIATED PHENOMENA.

By I. M. ALLEN,
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THE following observations on grasping and tonic innervation have been made on patients studied personally in the course of clinical examination, and are considered particularly in regard to the form and nature of the phenomena themselves and the association with them of other variations from the normal in the patients in whom they are found.

The Literature.

The literature of the subject has been reviewed on several occasions during recent years, and in particular by Walshe and Robertson (1933). To indicate the background upon which this study began it will suffice to summarize the main observations and the essential conclusions from them.

Steinert (1903) described a tumour of the paracentral lobe associated with tonic innervation of the right arm. Some years later Wilson and Walshe (1914) described tonic innervation which they had observed in the paretic hands of patients with frontal lobe lesions. They found that voluntary flexion and extension of the arm were followed by delay in relaxation and that the hand was unable to release its grasp of an object placed in it. Attempts to extract the object led to greatly increased force of the grasp, which persisted until the attempt to remove the object ceased. When the grasp was not forced, the hand frequently opened without difficulty. No reflex factor was found to initiate the phenomenon. Riddoch and Brain (1923) suggested that the stimulus was a touch on the palm and that the phenomenon was a palmar reflex. Meanwhile, Schuster (1923) and Schuster and Pineas (1926) had studied the features of grasping and tonic innervation in detail. Certain new features described by them may be mentioned. They found that the hand involuntarily grasped at an object brought near it before it made contact with the palm of the hand, after it was withdrawn from the grasp and after it was withdrawn from the neighbourhood of the hand; and that, when palmar stimulation was employed, the hand and arm turned actively towards the stimulating object and followed it as though it were a magnet. Schuster concluded that the grasping movements were involuntary and that the exciting stimulus was the contact of some object with the palm or fingers.

Adie and Critchley (1927) confirmed these findings and amplified them considerably. The grasping movement of the fingers followed any moving contact with the palm, which was most effective when applied to the region of the metacarpo-phalangeal joints. In response to this stimulus, even when the eyes were closed, the hand, arm and trunk were turned towards the stimulating object and followed it as if it were a magnet, the patient being unconscious of these complex movements, though he appeared to be annoyed by them. Grasping became firmer and more persistent when an attempt was made to pull away the object contained in the hand, whereas voluntary clenching of the empty hand produced no tonic grasp and was followed by no difficulty in relaxation. Both Schuster and Adie and Critchley regarded the phenomenon as a reflex response to tactile stimulation of the palm of the hand. Adie and Critchley referred in addition to the grasping which occurred before the hand was touched as being on a still higher plane than the rest of the phenomena.

Walshe and Robertson (1933) examined critically not only these conclusions, but also the observations on which they were based, and decided that the factors responsible for the phenomena still remained to be elucidated and that some of the recorded observations were probably inaccurate. They examined eight cases and found that phenomena in two categories were to be observed. There was a grasping movement of the fingers, often accompanied by movement of the whole arm and hand through space, highly coordinated and capable of a degree of adaptation that revealed the activity of the cerebral cortex. It was initiated by either a visual or a tactile stimulus. The former acted and led to movement of the limb through space only when the patient could see and fix with his eyes the stimulating object; the latter alone resulted in only a grasping movement of the stationary hand when the patient's eyes were covered. To be effective the visual stimulus had to be such as to make grasping a natural response, and the tactile stimulus had to be of the nature of moving contacts with the palm, such as were made by an object offered to the hand. Both the grasping movements of the hand and the movement of the limb through space could be prevented by the patient. There was also a tonic contraction of muscles, elicited solely by stretching, persisting as long as the stimulus was continued, failing to show highly delicate adaptation and capable of occurring in the semi-conscious patient. The grasping movements occurred in patients with some impairment of higher cortical functions. Subsequently, Walshe and Hunt (1936) produced evidence to show that the voluntary grasping movements were determined by mental factors and could not be called reflex, whereas tonic grasping was exclusively a proprioceptive reflex reaction to stretch.

Experimental examination of the physiological basis of the phenomena has been more recent. Richter and Hines (1932) showed that a lesion of Brodmann area 6 in rhesus monkeys was followed by involuntary grasping. Fulton, Jacobson and Kennard (1932) confirmed these findings in regard to grasping and included spasticity of the limb and increased activity of the tendon reflexes. There was no change in behaviour. Bieber and Fulton (1933) demonstrated that "forced grasping" which followed a lesion of Brodmann area 6 varied in intensity with the position of the animal in space and that in animals from which the motor and premotor areas were removed on both sides the righting reflexes of Magnus and de Kleyn (1922) were present. They concluded that "forced grasping" was part of the righting reflex mechanism peculiar to primates. Kennard, Viets and Fulton (1934) had already expressed this view in regard to man in their report of a case in which they described a syndrome of the premotor cortex of man as impairment of skilled movements, forced grasping, spasticity and vasomotor paresis. In contesting this view, Walshe and Hunt (1936) preferred to regard grasping as interacting with the righting reflexes of Magnus and de Kleyn instead of being part of them. Nevertheless, these experiments have shown that "reflex grasping" is caused in the monkey by a cortical lesion restricted to the premotor area.

In man clinico-pathological studies by Adie and Critchley (1927) and by Walshe and Robertson (1933) have shown that the lesion most often associated with the phenomena described has been one of the posterior part of the frontal lobe, just in front of the motor area. Bucy (1931) has, however, reported two cases, only one described in detail, in which the lesion was far distant from the frontal lobe.

Recently, Bieber and Fulton (1938) have shown in more detail from work on the adult monkey and baboon that bilateral ablation of the premotor and motor areas of the cerebral cortex resulted in the appearance of the righting reflexes and occasionally of the neck and labyrinthine reactions. The animal exhibited a stereotyped pattern identical with that described by Magnus for the thalamic monkey. In the lateral position the undermost extremities were fully extended and the uppermost were flexed and showed a conspicuous grasp reflex, the pattern being reversed when the animal was turned over. Bieber and Fulton analysed the grasp reflex as part of the thalamic reflex pattern. They found that the grasp reflex not only varied directly with the righting reflexes according to the position of the animal in space, but was also influenced to some extent by the neck and labyrinthine reactions when they were present. The skin receptors were not essential for the eliciting of the grasp reflex, and stretch of the digital tendons was the most effective stimulus. They concluded that the grasp reflex was an integral part of the body righting reflex mechanism.

Summary of the Clinical Observations.

Observations were made on sixteen patients. The extent of the observations varied with individual

patients. In some cases the opportunity was taken of making observations at intervals during the progress of the condition to the death of the patient; in others during progression and subsequent regression of a lesion, so that it was possible to study the behaviour of the phenomena during recovery; and in others before and after procedures such as biochemical dehydration or partial emptying of the lateral ventricles of fluid. The records of five cases have been chosen for summary, the observations made on them being fully representative of those made on the whole series. For brevity in description the term "object" is used to indicate the observer's first and second fingers, a fountain pen or a small torch.

Summary of Case I.

1. The patient showed evidence of what appeared to be a progressive lesion of both frontal lobes. At autopsy there were found a moderate degree of internal hydrocephalus, some sclerosis of the cerebral arteries and no obvious thrombosis of cerebral vessels.

2. The patient was stuporose, but could be roused enough for him to cooperate.

3. There was no evidence of a gross lesion of the motor path. Slight interference with the motor path to the right limbs was probably present during the last series of observations.

4. In the early stages: (a) The right hand failed to follow and grasp an object which was offered and could be seen by the patient. (b) The right hand did not follow in the general direction of an object stroking the palm when the patient's eyes were open. (c) When the patient's eyes were closed the right hand followed in the direction of the stimulating object after the first two or three strokes and then stopped. (d) A catatonic condition was demonstrated in the left upper limb, the limb remaining in a position into which it was moved passively until the patient was directed to move it or until it was moved passively. (e) Neither grasping nor persistent increase of tone in response to stretch could be demonstrated in either the right or the left upper limb.

5. Four days later: (a) A definite grasp followed gentle stimulation of the right palm by a moving object. (b) Passive movement revealed some degree of tonic innervation in the right upper limb.

6. Three days later: (a) A definite grasp followed gentle stimulation of the right palm by a moving object. (b) The addition of stretch to this stimulus by an attempt to remove the object resulted in the grasp persisting and becoming more pronounced. (c) In both the right and left upper limbs passive movement resulted in steadily increasing tone of the muscles, which relaxed very slowly after the stimulus ceased.

7. Two weeks later: (a) The patient was stuporose and, though he could be roused, visual cooperation could not be maintained. (b) Opening and closing of the hand occurred normally at command, as it had throughout. (c) There was no movement of the hand and arm towards an object offered or after an object had been removed from the hand. (d) Moving contact with the palm produced no response. (e) Stimulation of the palm as in testing sensation for touch and pain produced no response. (f) Stretch of the tendons either directly or when removing an object from the palm was followed by tonic grasping, which persisted as long as the stimulation continued and subsided gradually after it was removed. (g) This response was part of a general response in the muscles of the corresponding limb, which was demonstrated as built up from stretch applied to flexors and extensors in turn. (h) These responses were more pronounced in the right upper limb than in the left, the degree of tonic grasping increasing pari passu with the degree of tonic innervation observed elsewhere in the limb. (i) In the

right hand stretch applied to the flexor tendons was more effective on the radial side of the palm than on the ulnar side; and in the left hand, where the results were less apparent, it was effective only on the radial side of the palm. (j) With the possible exception of a transient response to moving contact with the palm only the effects of stretch were found.

Summary of Case II.

1. The patient manifested right hemiparesis, nominal aphasia, swelling of the optic disks, extensive retinal hæmorrhages, almost complete loss of vision and disorientation. At autopsy there were found a tumour of the left occipital lobe, a moderate degree of internal hydrocephalus and extensive œdema of the brain.

2. When the patient was at his worst both physically and mentally, a catatonic condition was demonstrated in the left upper limb. No other phenomena associated with grasping and tonic innervation were found in either upper limb.

3. When the condition of the patient had improved both physically and mentally, the right hemiparesis had disappeared and speech had become normal, a tonic grasp of the left thumb and index finger of the crab claw type was produced by stretch or movement leading to stretch of the flexors of the thumb and to a lesser extent of the index finger of the left hand. No other phenomena associated with grasping and tonic innervation were found.

4. As indicated in Case I, the maximum effect was produced from stretch of the flexors of the thumb rather more than those of the index finger, and it was not within the control of the patient. He could neither prevent it when told to do so nor stop it while the stimulation continued.

Summary of Case III.

1. The patient showed evidence of a lesion of the midbrain, left frontal lobe and to a lesser extent of the right frontal lobe, evidently inflammatory in origin and passing through various stages to apparent recovery.

2. At the first examination: (a) Simple contact of an object with the palm of the right hand produced no effect. (b) Movement of the object in contact with the right·palm was followed by grasping which could be prevented or stopped by the patient at command. (c) Movement of the object in contact with the right palm together with stretch of the flexors of the digits was followed by an increasing grasp, which could be neither prevented nor stopped by the patient at command.

3. At the second examination the following day: (a) Offering the object near the right hand or removal of it from the hand when the eyes were open was followed by movement of the hand towards the object and grasping of it. This was associated with a compulsion to do it. The patient said: "I had to", or "I thought you wanted me to". When she was told not to move the hand towards the object and grasp it, control of the compulsion in that way at command was maintained for only a short time and then failed. (b) Movement of the object in contact with the palm after (a) was followed by increased grasping, which could also be controlled only temporarily by the patient at command. (c) The addition of stretch of the flexors of the digits to the stimulus was followed by increasing grasp, which persisted as long as this part of the stimulus continued. (d) The patient could not control the grasp even temporarily at command when stretch of the flexors of the digits was employed. (e) Opening and closing of the hand were normal when it was empty. (f) With the eyes closed there was no movement of the right hand towards an object offered near by, and no following of an object removed from the palm. (g) Grasping occurred in response to movement of the object in contact with the palm and not to simple contact. (h) The addition of stretch of the flexors of the digits resulted in tonic grasping.

4. On the second examination it was observed in the left hand that: (a) There was no movement towards nor grasping of an object offered when the eyes were open. (b) Grasping occurred in response to movement of the

object in contact with the palm and not to simple contact. It could be controlled by the patient at command more easily than that produced in the right hand in response to offer of the object where it could be seen, or movement of it in contact with the palm. (c) There was no obvious response to stretch of the flexors of the digits. No response to stretch was seen at any time in this hand. (d) Opening and closing of the empty hand were normal.

5. Four weeks later the patient's condition had improved considerably. Upward deviation of the eyeballs was normal and the right abdominal reflexes were only a little less active than the left. No phenomena were observed in the left hand. In the right hand: (a) There was no response to an object offered where the patient could see it, ordinary stimulation of the palm of the hand and movement of an object in contact with the palm of the hand with the eyes open or closed. (b) To stretch a crab claw grasp was obtained, the stimulus with the maximum effect being stretch of the flexors of the thumb with the palm presenting downwards. This occurred with the eyes open and closed. During the application of the stimulus the patient could not undo the grasp at command. (c) At that stage the only obvious mental defect was inability to plan and carry out a series of actions, which was in contrast with the ease with which routine work was undertaken.

6. The following contrasts were observed between the two hands: (a) In the right hand grasping movements in response to offer of an object where it could be seen or movement of it in contact with the palm were associated throughout with the effects of stretch of the flexors of the digits in the production of a grasp reflex or tonic innervation. The former could be brought temporarily under the patient's control, whereas the latter were not under her control. The effects of stretch persisted longest during recovery. (b) Grasping movements only were observed in the left hand. They occurred in response to movement of an object in contact with the palm and not to offer of an object when it could be seen. No effects of stretch were seen.

Summary of Case IV.

1. The patient was a child, nearly three years old, with distension of both lateral ventricles, probably due to a partially mobile obstruction in the third ventricle. The diagnosis was confirmed by ventriculography. In the early stages there was some interference with motor function of the right upper limb with the plantar reflex in extension, whereas in the later stages this disability had disappeared. The child was reduced mentally to a very low level, but improved considerably so as to be able to walk, though not to speak, at the time the final observations were made. Throughout she could see only in a part of the visual field to her left.

2. In the early stages: (a) A distinction was noted between an unvaried and uncontrollable closure of the teeth in response to stretch produced by pressure of an object on the edge of the teeth, and a fully coordinated sucking response to movement of an object in contact with the inside of the cheek. (b) Grasping and tonic innervation in response to stretch were found in the right upper limb, and grasping with minimal tonic innervation in the left upper limb. A detailed examination of the individual factors involved was not made at this stage. (c) In the foot grasping was not produced by movement of an object in contact with the sole, but occurred in response to pressure on the sole in such a way as to stretch the tendons. It persisted as long as the stimulus continued, and was characterized by separation and flexion of the toes with grasp of the object. (d) The occurrence of phenomena in two different categories was apparent from observations on the mouth. (e) Grasping in the hands and feet and the phenomena observed about the mouth were evidently parts of the same condition affecting the whole body and not any particular part of it.

3. Emptying of the lateral ventricles of fluid and replacement of the fluid by oxygen were followed by disappearance of grasping and tonic innervation and of the

phenomena about the mouth. After an interval of three days, probably sufficient for the absorption and replacement by fluid, these phenomena all reappeared.

4. At the time of the last series of observations, four months later: (a) Movement of the whole limb and hand towards the object offered, without its being brought into contact with the palm, and subsequent grasping occurred only on the left side, to which the patient could see the object. (b) Contacts with the palm, as when sensation for touch and pain is tested, produced no grasping. (c) Contact of the object with the palm in such a way as to suggest the placing of the object or its withdrawal, both involving movement in contact with the palm, was followed by grasping. This response was more pronounced on the side to which the patient could see the object, and was more obvious with stimulation of the radial side of the palm. Cessation of movement was followed by relaxation of the grasp. (d) Pressure upon the flexor tendons, passive extension of the fingers or withdrawal of the object in such a way as to stretch the fingers or hand was followed by firm grasping of the object, which relaxed only when this form of stimulation ceased. (e) Stretch of the flexors of the thumb and index finger was more effective than that of the flexors of the other digits. (f) The empty hand opened and closed with ease. Because of lack of full cooperation it was impossible to determine whether this would occur at command.

5. The two types of response—grasping in response to stretch and grasping in response to visual or tactile stimulation or to both together—appeared to correspond to the two types of response in the mouth: tonic closing of the teeth in response to stretch and the coordinated sucking response to stimulation of the inside of the cheek.

6. There was some evidence that tactile stimulation was more effective in the production of grasping than visual stimulation, and that visual stimulation with tactile stimulation was more effective than either of them alone. Both were much less effective than stretch.

Summary of Case V.

1. The patient was a woman, aged sixty-five years, who came under attention when stuporose. At autopsy there were found a tumour of the right prefrontal region just in front of the motor area and extending to the longitudinal sinus and falx cerebri, distension of the right lateral ventricle and extensive œdema of the brain. Observations on grasping and tonic innervation were made on five occasions when the conditions differed.

2. On the first occasion the patient was stuporose, visual cooperation could not be maintained, the left side of the face moved less freely than the right, the tendon reflexes of the left upper limb were more active than those of the right, the left knee and ankle jerks were more active than the right, and the left plantar reflex was in extension. It was observed that: (a) In the right upper limb: (i) Stimulation of the palm by touch or pin-prick failed to produce flexion of the fingers; movement of an object in contact with the palm was followed by gentle grasping; and movement of the object so that it pulled on the fingers was followed by grasping, which became firmer as the pull continued. (ii) Both movement in contact with the palm and stretch of the flexors of the thumb and digits were most effective in the region of the metacarpo-phalangeal joints of the thumb and index. (iii) Stretch of the flexors of the digits was followed by tonic grasping. (iv) The hand did not follow an object moving in contact with the palm or withdrawn from it. (b) In the right lower limb passive movements at the knee were followed by increasing tone of the muscles, which relaxed after the movements ceased. (c) In the left upper limb: (i) Neither sensory stimulation, simple contact of an object nor movement of an object in contact with either the radial or ulnar side of the palm was followed by flexion of the digits and grasping. (ii) Grasping occurred and increased response to movement of an object in such a way as to put stretch on the fingers. (iii) The hand did not follow an object in contact with the palm or withdrawn from it. (iv) Stretch

applied to the flexors of the digits resulted in a minor degree of increase of tone, which disappeared slowly when the stimulation ceased. (v) Passive flexion and extension at the elbow were followed by rapid increase of tone of the muscles until the limb became completely rigid. This rigidity subsided slowly when the stimulation ceased. (d) On passive movement at the left hip, knee and ankle there appeared a steadily increasing resistance until the whole limb became rigid. This rigidity subsided gradually when the stimulation ceased. (e) In the upper limb increase of tone was apparent first and most in the flexors, and in the lower limb it appeared first and most in the extensors. There was, however, a slight degree of hemiparesis.

2. On the second occasion the patient was much clearer mentally, visual cooperation was possible during the greater part of the examination, and motor power was very slight against resistance at the left wrist and finger joints. The patient was examined eight hours after she had received a hypertonic solution of magnesium sulphate rectally. (a) In the right upper limb: (i) With the eyes open an object offered near the hand was followed by the hand and grasped gently. The grasp was relaxed at will or command. (ii) With the eyes open, movement of the object in contact with the palm resulted in the hand following the object and grasping it. The grasp was relaxed at command. (iii) With the eyes closed there was no movement of the hand towards, or grasping of, an object not already in contact with the palm. Repeated movement of the object in contact with the palm resulted in the hand following in the direction of the movement, as if to bring the object completely within the palm and thus through space until it finally grasped the object. The grasp was relaxed at command. (iv) The ordinary methods of testing sensation had no effect. (b) In the left upper limb all examinations were made with the patient's eyes closed, as visual cooperation could not be maintained at that stage. The effects were only slight, being confined to transient flexion of the digits in response to movement of the object in contact with the radial side of the palm only, slight flexion of the thumb and index in response to stretch of the flexors of the thumb and index, and transient flexion of the other digits in response to stretch of their flexors. (c) The response to stretch at the left elbow, in the left lower limb and in the right lower limb was unchanged.

3. On the third occasion, six days later, the patient was clearer mentally and cooperated more freely, visual cooperation being maintained throughout. The weakness of the left forearm, hand and fingers was at its maximum. (a) In the right upper limb: (i) Voluntary opening and closing of the hand were normal. (ii) The hand moved slowly towards an object presented where the patient could see it, followed it when it was moved away slowly, and finally grasped it. The grasp was undone readily at command. (iii) There was evidence of a compulsion to move after and grasp the object presented where it could be seen. This compulsion continued, even though the patient was told the response was not required. When the patient was asked why she moved her hand towards and grasped the object presented near by, she said: "I thought you wanted me to", or "I had to". When she was told that it was not necessary for her to grasp the object when it was presented, she continued to move the hand towards the object and to grasp it every time it was presented where she could see it. (iv) With the eyes open or closed, movement of the object in contact with the palm was followed by movement of the hand in the direction of the object as if to bring it wholly within the palm and finally by grasping of the object. The grasp was undone readily at command. (v) There was a similar compulsion to respond as above to movement of the object in contact with the palm. It was not prevented when the patient was told that the movement in the direction of the object and the grasping were not required. (vi) In other respects the findings were unchanged. (b) There was no response of any kind in the left hand. (c) The response to stretch at the left elbow and in the left lower limb was unchanged.

4. Four weeks later the patient was clear mentally and cooperated fully. The motor disability in the distal part of the left upper limb had recovered and the left plantar reflex was in flexion. (a) The response to stretch at the left elbow and in the left lower limb was unchanged. (b) In both upper limbs there was otherwise the same response. (c) Presentation of an object near the hand was followed by movement to it and grasping only when the eyes were open. Movement of the object in contact with the palm was followed by grasping, whether the eyes were open or closed. In both cases the grasp was undone readily at command. It no longer occurred in response to the appropriate stimulus when the patient was told it was not required. (d) There was neither movement of the hand after an object removed from the palm nor in the direction of movement in contact with the palm when the eyes were closed. (e) Stretch of the flexors of the digits was followed by flexion and grasping. This was undone repeatedly by the patient at direct command, even though the appropriate stimulation continued. It also failed to appear for a short time in response to the appropriate stimulus when the patient was told that a response was not required, and then appeared rapidly, as if the response to the stimulus had broken past the control by the patient.

5. On the fifth occasion, two months later, the patient was examined during a lucid interval between phases of confusion. The phenomena under consideration were present in both upper limbs. Examination was directed towards a determination of the effect upon the phenomena of the position of the patient in space. The findings are outlined in the accompanying table.

Conditions and Type of Stimulus.	Position of the Patient.	
	Lying on Right Side.	Lying on Left Side.
Right upper limb—Eyes open:		
Object close to hand.	Moved hand slowly, grasped loosely, let go at once on command.	More abrupt movement of hand; grasped more firmly; let go on command.
Object offered; told not to grasp.	No response.	No response.
Object offered and moved away slowly.	Hand moved to object and stopped on object being moved away.	Hand moved to object; followed it as long as it remained close to hand; firm grasp.
Simple contact with palm.	No response.	Slight grasping; let go on command.
Moving contact with palm.	No response.	Very firm grasp; let go on command.
Right upper limb—Eyes covered:		
Moving contact with palm.	Very gentle grasp; let go at command.	Firmer grasp; let go on command.
Stretch to flexors of digits.	Slight increase of tone of flexors; let go on command.	Pronounced increase of tone and grasp; let go on command.
Stretch at wrist.	No effect on tone.	Increased tone at once.
Stretch at elbow.	No effect on tone.	Increase of tone at once.
Left upper limb—Eyes open:		
Object close to hand.	Moved hand to object; grasp; let go on command.	No response.
Object offered; told not to grasp.	No response.	No response.
Object offered and moved away.	No response.	No response.
Simple contact with palm.	Grasp; let go on command.	No response.
Moving contact with palm.	Good grasp; let go on command.	No response.
Left upper limb—Eyes covered:		
Simple contact with palm.	Slight grasp, less than with eyes open; let go on command.	No response.
Moving contact with palm.	Firmer grasp, less than with eyes open; let go on command.	No response.
Stretch flexors digits.	Much firmer grasp, increase with stimulus; let go on command.	Very slight increase of tone; no definite grasp.
Stretch at wrist.	Rapid increase of tone.	No increase of tone.
Stretch at elbow.	Very pronounced increase of tone; limb rigid after three passive movements.	Tone increased very slowly and to lesser extent.

The Form and Nature of the Phenomena.

The observations confirmed the conclusions of Walshe and Robertson (1933) as to the occurrence of two groups of phenomena in the human subject, but failed to demonstrate the rigid division between them indicated by those workers. There were demonstrated two groups of phenomena: one labile, variable, fully coordinated and sometimes but not always capable of being brought under control by the patient—evidently related to integrations at the level of the cerebral cortex; the other of a fixed pattern, arising from a constant stimulus and usually but not always incapable of being brought under control by the patient—related to processes not directly involving the cerebral cortex. The former were cortical in origin, but not necessarily voluntary, and were evidently influenced to some extent by the processes more directly responsible for the second group; the latter were occurring at a lower physiological level, which has not yet been determined, were involuntary and induced by a stimulus of a fixed type, but could be brought to some extent, especially in their lesser forms, under control from the cerebral cortex. The occurrence of cortical and infracortical groups of phenomena, as indicated first by Walshe and Robertson (1933), was confirmed, but could be accepted in the human subject only with interaction and interdependence of the processes underlying the two groups.

1. Grasping or grasping movements did not occur in response to simple visual or tactile stimulation. The sight of objects did not result in the patient's moving the hand towards them and grasping them; nor did simple tactile stimulation of the palm, as in a test of sensation, whether the patient could or could not see, result in grasping movements. It was often difficult, however, to confine the stimulation to simple tactile stimulation; and there were times when a single transient flexion of the thumb and digits occurred in response to tactile stimulation of the palm when the patient could see, to tactile stimulation associated with movement in contact with the palm or to tactile stimulation with which was associated pressure upon or stretch to the structures beneath the skin.

Fully developed grasping movements were as follows. When an object was offered within a reasonable distance of the hand, usually within six inches, where the patient could see it, the hand was moved slowly towards it, brought it within the palm by a series of fully coordinated movements and grasped it loosely. The grasp was undone at command. This response did not occur when the object was offered at a distance of twelve inches or more. When the object was moved slowly away from the hand approaching it, the hand followed it slowly, eventually approached it, took it within the palm and grasped it loosely. When, however, the object was moved away rapidly from the following hand, the hand stopped and, was then withdrawn slowly.

When the object was offered by its being brought into moving contact with the palm, the hand grasped it loosely when the patient could or could not see. The grasp was relaxed at command. When moving contact continued towards one side of the palm, the hand moved in that direction as if to bring the object fully within the palm, followed the object with successive moving contacts and then grasped it loosely. The grasp was undone readily at command. Both the grasping and the groping, when present, were more pronounced when visual and tactile stimulation were acting together than when either of them was used alone.

When asked why the grasping and groping occurred, the patient replied: "I had to" or "I thought you wanted me to". When told before not to follow or grasp the object, the patient refrained from doing so. Often, however, the usual response still occurred at once or after an interval of up to ten seconds from presentation of the object by visual, tactile or visual and tactile stimulation.

Associated with the grasping or grasping movements was the catatonia observed in some cases and illustrated in Cases I and II, in which it was observed independently of the other phenomena, though some of them appeared later in the affected limb. With this condition the first phase was the direction to move the limb or the passive movement of it into a certain position, in which it remained until the command was given to change it.

In Case III grasping was observed in the foot and what were evidently related phenomena in the mouth. Grasping occurred in the hand in response to moving contact with the palm, but did not occur in the foot with only moving contact with the sole. In the mouth moving contact of an object with the inside of the cheek was followed by a fully coordinated and repeated sucking response. This widespread distribution of the phenomena was not found in any patient independently of responses to stretch.

2. Tonic innervation and the true grasp reflex occurred only in response to stretch and were thus the result of proprioceptive stimulation, as demonstrated by Walshe and Robertson (1933) and confirmed by Walshe and Hunt (1936). Simple stretch to the muscles by passive movement of the limb resulted in increase of muscle tone until the limb became rigid, the rigidity subsiding gradually when the stimulation ceased. In the hand increased tone and flexion of the thumb and digits, with grasping, were produced by stretch of the flexors of the thumb and index finger and other digits, and increased as long as the stimulation continued, subsiding gradually only after it ceased. It resulted in grasping of the object, which became more pronounced as the stretch of the tendons, traction on the hand or pressure upon the subcutaneous structures continued. In its more pronounced forms it was not undone by the patient at command; and in some cases it was present when the patient was stuporose or unconscious. In its minor forms, as illustrated by the later stages of Case V, it was undone at command. In the hand stretch of the

tendons of the radial side of the palm was always more effective than that of the tendons of the ulnar side, and stretch of tendons of the thumb and index finger was more effective than that of other tendons. Repeated observations showed that the response to stretch appeared first from the tendons of the thumb and index finger during the development of the phenomena under consideration and continued there longest when they were subsiding. In Case III it was shown to persist longest from the thumb and index finger during recovery with the palm presenting downwards. In Case II stretch of the tendons of the thumb and index finger was found to be effective shortly after catatonia was demonstrated in the same limb. In Case V it was shown that a pronounced degree of paresis with diminution of muscle tone due to a lesion of the upper motor neurone was associated with absence of the grasping and tonic innervation in the part of the limb most affected, whereas it could be demonstrated at the elbow, which was affected to a lesser extent. With disappearance of the effects of the lesion of the upper motor neurone, grasping and tonic innervation appeared in the distal part of the limb.

In some cases, such as Case III, grasping appeared in the feet in response to stretch of the flexors of the toes. In Case IV there also appeared a trap-like closure of the teeth in response to a stimulus consisting of pressure on the edge of the teeth and evidently involving stretch of the muscles of the jaw. This widespread distribution of the phenomena has been mentioned by other workers even when attention was concentrated upon the appearance of variations in the hand. Schuster and Pineas (1926) referred to one patient who exhibited a grasp reflex in the foot as well as in the hand. Symonds (1928) showed a patient with tonic innervation in the feet, subsequently described by Critchley (1928) as a grasp reflex. Sittig (1932) examined 29 patients, referred to by Brain and Curran (1932), with a grasp reflex appearing in the foot in 24 instances and in the hand in only nine. Brain and Curran (1932) described a grasp reflex in the foot, found it normally present in the human infant during the first year of life, demonstrated that it occurred in 50% of mongolian imbeciles, and also found it associated with lesions of the frontal lobe. Emphasis upon the proprioceptive nature of the grasp reflex by Walshe and Robertson (1933) and recognition of it as a local effect of tonic innervation finally included these observations in one group.

It was chiefly in cases in which apraxia was present that there was difficulty in opening or closing the empty hand at command. In addition, the presence of a lesion of the upper motor neurone with some spasticity was associated with delay in undoing the grasp.

3. The order in which the phenomena developed during the progression of a lesion, disappeared during progression of a mental state through stupor to coma, and disappeared during recovery of a lesion, appeared to be inconstant. In this respect it was impossible to confirm the suggestion of Walshe and Robertson (1933) that tonic innervation appeared first and disappeared last.

In Case I, in which the mental condition progressed steadily through stupor to coma, there was no true grasp reflex or tonic innervation in the early stages, and the hand followed in the direction of the stroking of the palm and grasped the object. Four days later the same condition was present and a slight degree of tonic innervation was demonstrated. Seven days after the first examination grasping in response to stroking of the palm was much more obvious, there was a pronounced grasp to stretch, and definite tonic innervation was found. Unfortunately, visual stimulation was not possible and could not be added to tactile stimulation to determine whether a greater degree of grasping would result. This was, however, demonstrated repeatedly in other cases. The results of the examination suggested that the phenomena might reveal themselves first in response to tactile stimulation without stretch, and more so with visual added to tactile stimulation, and that at a later stage grasping movements in response to moving tactile stimulation increased *pari passu* with the increase of tactile stimulation and the true grasp reflex. Three weeks from the time of the first examination only the true grasp reflex in response to stretch and tonic innervation was found. The disappearance of grasping movements in response to moving contact with the palm would thus appear to have been due entirely to the fact that tactile stimulation was actually no longer available as a stimulus. It had been removed from participation in the production of the phenomena owing to the state of consciousness of the patient, just as visual stimulation had been removed when the patient closed his eyes.

Observation on the left upper limb in Case III suggested that the sequence was that already mentioned. Grasping movements, readily controlled at command, occurred in response to tactile stimulation and were more apparent when visual was added to tactile stimulation; but no true grasp reflex or tonic innervation was found in response to stretch.

Observations on the right upper limb in Case III, however, revealed grasping movements, only temporarily controlled at command, to tactile stimulation more than to visual stimulation, and more to both together than to either alone in association with a true grasp reflex and tonic innervation in response to stretch. During recovery the only feature that remained was a crab claw grasp in response to stretch of the flexors of the thumb and index finger when the palm presented downwards. The only feature observed in Case II was also a crab claw grasp in response to stretch of the flexors of the thumb and index finger. There was no response to either tactile or visual stimulation or to both together.

Observations were made particularly on the two upper limbs in Case V in five series with which

the associated general and local conditions varied. General conditions varied only in regard to the right upper limb, and both general and local conditions in regard to the left upper limb. The response of the muscles to stretch varied little with the condition of consciousness and the cooperation of the patient as long as the position of the patient in space, the position of the head and the condition of the upper motor neurone remained constant. In the right upper limb, in which the effects of a lesion of the upper motor neurone did not appear, the following sequence of events was noted. When the patient was stuporose and could not cooperate visually, tonic innervation and a grasp reflex to stretch were found. Moving contact of an object with the palm was followed by gentle grasping. Following dehydration the patient was clearer mentally and could cooperate during the examination. The effects of stretch were unchanged. Movement of the hand towards an object offered and grasping occurred in response to visual stimulation, to visual and tactile stimulation together, and to tactile stimulation alone. In the third series, when the patient was even clearer mentally and could cooperate more freely, these findings were unchanged. During the fourth series the patient again cooperated fully. Grasping occurred in response to tactile stimulation alone and with visual stimulation, but not to visual stimulation alone. The hand did not move after an object presented by either visual or tactile stimulation. The patient did not grasp the object when she tried not to do so either voluntarily or at command. The effects of stretch were unchanged, but the grasp in response to stretch could be undone at abrupt command, even though the appropriate stimulation continued. During the fifth series the condition of the patient and the observations were the same as in the third series, with two exceptions. The patient grasped and continued to grasp an object presented by tactile stimulation, in spite of attempts not to do so, both voluntarily and at command, and the grasp in response to stretch was finally undone at direct command, although the stimulation continued. All aspects of the phenomena were affected by changing of the patient's position in space.

Thus in some cases the response to stretch appeared first and persisted longest. In other cases a response to visual, tactile or visual and tactile stimulation occurred first without any demonstrable effect of stretch. The latter appeared at a later stage. In other cases, in which recovery occurred, the response to visual and tactile stimulation persisted after it was no longer possible to demonstrate even the slightest response to stretch. These variations were not influenced by the nature of the local condition—whether it was a definite local lesion, distension of the lateral ventricle or cerebral œdema.

That the response to stretch is the fundamental feature of tonic innervation and the true grasp reflex is now beyond doubt. In the human subject, however, those phenomena which appear in response to stretch and which operate at a physiological level below that of the cerebral cortex occur in association with the other phenomena, which are evidently related to integrations at the level of the cerebral cortex and which have been shown in this series of observations to be compulsive rather than voluntary.

The apparent disagreement in the observations outlined above may be explained in the following way. The infracortical and cortical processes interact and are to some extent dependent upon one another. In the healthy subject neither is capable of coming into operation alone, as they are brought into cooperation with the integrations of the cerebral cortex as a whole. With the lowering of general cortical functions, stressed by Walshe and Robertson (1933) and confirmed here as the usual condition, various parts of the more fundamental cortical integrations and processes at an infracortical level may come into operation alone. Those at an infracortical level may come into operation alone or with more fundamental integrations at the cortical level. In the latter case, which is that most often seen, the processes at the two levels are interdependent and interact. While usually seen together, phenomena related to either the cortical or the infracortical processes may appear first during the development of a lesion or persist longest during its recovery. Responses related to the cortical processes are readily controlled in the healthy subject, but act as compulsions which can be brought under voluntary control in the subjects under examination. At a later stage they may act as compulsions which cannot be prevented in spite of deliberate attempts to control them. The infracortical phenomena are not as a rule under voluntary control, persist during stupor and coma, and are present when those of the cortical group no longer occur. In their minor forms they can be brought under control at abrupt command in spite of continuation of the appropriate stimulation. Both cortical and infracortical groups of phenomena are affected by changes in the position of the patient in space.

The Association of Other Factors with Variations in Grasping and Tonic Innervation.

In this section are summarized observations on the association of other factors with the phenomena under discussion and their possible relationship with variations in grasping and tonic innervation.

Mental State, Stupor and Coma.—In none of the sixteen patients examined were the mental functions normal. There was at least some impairment of memory and attention, and cooperation lessened considerably in the course of examination. It was difficult to determine the mental state of patients with aphasia and of two patients who were visually disorientated, but the general impression was that it was not normal. More serious degrees of mental impairment were common.

The phenomena in response to stretch persisted in spite of variations in the mental state and were

found during phases of relatively good mental cooperation, stupor and coma. Sometimes they were more obvious during stupor and coma; occasionally they were less apparent. The difference in either direction was small.

In contrast with these observations, Richter and Paterson (1932) induced a "reflex grasping reflex" in adult monkeys by the use of several pharmacological agents which were cerebral depressants in the large doses given and which had a definite effect on the responsiveness of the animals, producing a dazed or stuporose condition. Freeman and Crosby (1929) also found "reflex grasping" in transient states following an epileptic fit, cerebral concussion and minor cerebral infarction, and in terminal conditions of unconsciousness associated with muscular rigidity from cerebral hæmorrhage, uræmic coma and tuberculous meningitis.

The cortical phenomena were found during phases of good cooperation, slight mental impairment and even severe mental impairment, but not during deep stupor or coma. Cessation of responses to visual stimulation followed interruption of visual stimuli, and responses to tactile stimulation no longer occurred when the patient was deeply stuporose. With development of the condition grasping occurred first to tactile stimulation alone, later to visual and tactile stimulation together or to visual stimulation, and later still movement of the hand after the object was added. At that stage tactile stimulation was more effective than visual stimulation, and the two together were more effective than either of them alone. With impairment of consciousness they disappeared in the reverse order.

Internal Hydrocephalus and Cerebral Œdema.—Both Fedorovoa and Janischewsky (1929) drew attention to the effect of internal hydrocephalus with increased intracranial pressure on the appearance of "reflex grasping". This condition seems to have been the important factor in the appearance of "bilateral reflex grasping" in the cases reported by Bucy (1931). In Case IV grasping and tonic innervation disappeared after the ventricles were emptied of fluid and reappeared after an interval sufficient for the absorption of oxygen from the ventricles and their refilling with fluid. In Case II a moderate degree of hydrocephalus and chronic cerebral œdema were associated with a crab claw grasp in response to stretch in the left upper limb in the presence of a tumour of the left occipital lobe. In Case V grasping movements and tonic innervation in the right upper limb were associated with œdema in the left cerebral hemisphere, and similar phenomena in the left upper limb with a tumour of the right frontal lobe, dilatation of the right lateral ventricle and cerebral œdema. Measures designed to reduce cerebral œdema were followed by rousing of the patient from stupor and the development of cooperation sufficient for responses to be obtained to visual and tactile stimulation. The response to stretch showed little change.

Apraxia.—There was no delay in unclasping the clenched fist of the patient who exhibited grasping and tonic innervation; and there was little delay in undoing of the grasp which had occurred in response to visual or tactile stimulation or to stretch. Four patients with apraxia manifested considerable delay in relaxing the grasp, and often the necessary movement occurred only after an attempt was made to perform another movement at command. Apraxia was thus an independent factor responsible for the delay in undoing of the grasp included in some of the earlier descriptions of the grasping phenomena.

A Lesion of the Upper Motor Neurone.—Attention was drawn in the earlier descriptions of grasping and tonic innervation to the disappearance of grasping with the development of a severe degree of hemiplegia. Bucy (1931) also stressed the difficulty in the determination of the site of the original lesion when grasping on one side was associated with severe hemiplegia on the other side, as the latter might conceal bilateral grasping from distension of the ventricles. Grasping and tonic innervation were still present with minor degrees of hemiparesis associated with an increase of tone in the flexors of the upper limb, and were then accompanied by delay in undoing of the grasp of the empty hand. An example of this delay in a case of infantile hemiplegia has been cited by Walshe and Hunt (1936), who stressed the fortuitous association of delay in undoing of the grasp from this cause with grasping and tonic innervation. The phenomena under consideration disappeared in Case V in the presence of a lesion of the upper motor neurone with diminution of muscle tone, and reappeared with recovery of motor function in the limb.

The Position of the Patient in Space.—It was found in Case V that with the patient in the lateral position all features of grasping and tonic innervation were increased in the limb which was uppermost and decreased or lost in the limb which was undermost. On reversal of the position of the patient features which had been pronounced with the limb uppermost were diminished or absent with it undermost; and on the other side features which had been absent or slight with the limb undermost appeared or increased with that limb uppermost. The position of the patient in space affected those features which appeared in response to visual and tactile stimulation as well as those which appeared in response to stretch. Kennard, Viets and Fulton (1934) also found that the position of the patient in space affected the grasp reflex; and Bieber and Fulton (1938) have shown that tonic innervation and the true grasp reflex appear to be an integral part of or at least to interact very closely with the righting mechanism. Thus not only must the phenomena in response to stretch and the compulsive phenomena at the cortical level interact in the human subject, and the former operate as an integral part of or closely with the righting mechanism, but the compulsive phenomena at the

cortical level must also interact closely with the primitive righting mechanism.

Nomenclature.

The nomenclature employed by Walshe and Robertson (1933) has been followed so far in this paper. That is, the term "grasping" or "grasping movements" has been used for the group of phenomena related to integrations at the cortical level, and the term "tonic innervation" for those which appear in response to stretch and operate at an infracortical level. "Tonic innervation" appears to be the best term for the phenomena in response to stretch wherever they occur, and "grasp reflex" can be applied to those arising more particularly in the hand. It may be objected that the latter term focuses attention upon one aspect of the phenomena and obscures their widespread distribution. Nevertheless the use of the term seems to be justified by the special clinical problems that arise in connexion with it. In regard to the features related to integrations at the cortical level, it has been shown by Walshe and Hunt (1936) and also in this study that they are essentially compulsive in nature and arise in response to visual and tactile stimuli. They can be undone voluntarily and at command when they have occurred and have been completed; but at the beginning they may be controlled voluntarily or at command, may be controlled for a short time and then escape control or may occur at once in spite of attempts to control them. The terms "forced grasping" and "forced grasping and groping" introduced by Adie and Critchley (1927) for the phenomena as a whole, and found unsuitable by Walshe and Robertson (1933) appear to be actually descriptive of the responses associated with integrations at the cortical level, and the terms "grasping" and "grasping movements" to have a more general application. To avoid confusion with the earlier meaning of "forced grasping" and "forced grasping and groping", and to indicate a characteristic feature of the response, the term "compulsive grasping" is probably the most suitable one.

Summary and Conclusions.

1. Observations have been made on grasping and tonic innervation in sixteen patients.

2. The observations confirmed the occurrence in the human subject of two groups of phenomena: one labile, fully coordinated and sometimes but not always capable of being brought under voluntary control; the other of a fixed pattern, arising from a constant stimulus and usually but not always incapable of being brought under voluntary control.

3. The first group occurs in response to visual stimulation, tactile stimulation or to both together. It consists in movement towards and grasping of an object presented at a short distance from the hand, where the patient can see, and in grasping of an object coming into moving contact with the palm, whether the patient can or cannot see, and with or without movement of the hand in the direction of repeated moving contact with the palm. Tactile stimulation is more effective than visual stimulation; and both together more than either of them alone. When completed, it is under voluntary control. At the beginning, however, it is compulsive in that the patient feels he has to do it. Sometimes it is controlled voluntarily or at command at the outset; at times it is controlled and then bursts past the control; and at others it appears at once in spite of attempts to control it. It is evidently related to integrations at the cortical level, and is at least analogous to the repeated sucking response observed in one patient.

4. The second group arises in response to stretch and appears even when visual and tactile stimulation are impossible. It is observed in the muscles of the limbs, in the hand and foot, and in the jaw. It consists in increase of muscle tone with, in the hand, a grasp which increases as the stimulation continues, and, in the jaw, a trap-like closure of the mouth and teeth on the stimulating object. It arises primarily and most effectively from stretch of the flexors of the thumb and index finger. It is not prevented by the patient either voluntarily or at command, but in its minor forms the grasp can be stopped and undone at command even though the appropriate stimulation continues. It is evidently operative at a level below that of the cerebral cortex.

5. It appears that the two groups of phenomena cannot be rigidly separated and that they are mutually dependent and interact in the human subject. Under appropriate conditions either one or the other group may be found alone.

6. The position of the patient in space affects the second group of phenomena in the same way as in the thalamic animal or the animal deprived of the motor and premotor areas of the cerebral cortex; that is, in the lateral position it increases them in the uppermost limb and decreases them in the undermost limb. It affects the first group of phenomena in exactly the same way.

7. Both the first and second groups of phenomena appear to interact very closely with the righting mechanism or to form an integral part of it.

8. The term "compulsive grasping" appears to be appropriate to the compulsive phenomena forming the first group, "tonic innervation" to those of the second group, and "grasp reflex" to those of the second group in the hand.

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THE HORMONAL BASIS OF THE MENSTRUAL CYCLE.

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THE cyclic physiological and morphological changes in the normal uterine mucosa were first elucidated as a result of careful microscopic study of the endometrium at different stages of the cycle.

As a result of this, four phases were classically described as the premenstrual or proliferative phase, the menstrual or destructive phase, the postmenstrual or reparative phase, and the interval or resting phase.

In spite of our more recent knowledge of the hormonal basis of these phases, little uniformity seems to have been attained in correlating the established morphological changes with the corresponding cyclic production of the essential hormones.

The internal secretions with which we are concerned are the following: (i) The first are the gonadotrophic anterior pituitary hormones, of which two are described. Prolan A is derived from the serum of pregnant mares, and has been shown to have a predominantly follicle-stimulating effect, although Friedman has demonstrated that it will also produce luteinisation in sufficiently high concentrations. Prolan B, the anterior pituitary-like or chorionic hormone, is derived from the urine of pregnant women, forms the basis of the Aschheim-Zondek test, and has, characteristically, a luteinizing effect. (ii) The second is the follicular or œstrogenic hormone, œstrin. (iii) The third is the luteal hormone.

The follicular hormone is believed to be derived from the *theca interna* cells of the Graafian follicle, and is present throughout the cycle.

The luteal hormone comes as an internal secretion from the characteristic lutein-containing cells of the *corpus luteum*, and is therefore present only in the second half of the cycle. It is agreed that both the internal secretions of the ovary are dependent upon and secondary to the influence of the gonadotrophic hormones of the anterior pituitary gland.

Under the influence of the follicle-stimulating hormone the ovary secretes œstrin, first from the *theca interna* cells of the ripening follicle, and after ovulation from the same cells of the *corpus luteum*. The rising concentration of œstrin in the blood as the cycle proceeds gradually inhibits the action and secretion of the gonadotrophic pituitary hormones, for it is an established fact that the œstrogenic hormone has this antagonistic, though synergistic, property.

At a certain stage in the cycle a point is reached when the concentration of œstrin is sufficient completely to inhibit further activity of the anterior pituitary gland in respect of its gonadotrophic hormones. As a result there is no further stimulus to the production of œstrin (prolan A effect), or to the further development or activity of the *corpus luteum* (prolan B effect). There is thus a fall in the œstrin content in the blood, and the *corpus luteum* begins to regress.

In the absence of further ovarian stimulus to proliferative or secretory activity, certain changes occur in the endometrium which bring the cycle to a close.

Subsequently the level of the anterior pituitary gonadotrophic hormone rises again, stimulates the activity of the newly ripening follicle, and the cycle is repeated.

This explanation, based on quantitative estimations of hormone excretion in the urine, offers us at least a working hypothesis of the hormonal basis of the menstrual cycle. Let us seek to correlate this with the established facts relating to the morphological changes in the endometrium.

It is now commonly stated that the œstrogenic hormone, amongst its other properties, is responsible for the "proliferative" phase of the endometrial cycle, and that the luteal hormone is responsible for the "secretory" phase; that the secretion of follicular hormone in the preovulatory period induces the development of the proliferative stage of the endometrial cycle, and that immediately after the extrusion of the ovum the *corpus luteum*, by its characteristic secretion, induces the "secretory" phase.

This latter assumption loses sight of the fact that there is little or no histological evidence of proliferative activity before the fourteenth day

(Wilfred Shaw), that is, not until after ovulation has occurred, and that the character of the endometrium during the preovulatory period is that described as the resting or interval phase. Nevertheless these terms are descriptive and worth retaining, provided we can reconcile them satisfactorily with the classical description of the premenstrual, menstrual, postmenstrual and interval phases.

Are not these proliferative and secretory phenomena both features of the premenstrual phase? Are they, in fact, no less than the "early premenstrual stage" and "late premenstrual stage" with which we were wont to signify their distinctive features, proliferative changes being the most characteristic sign in the early stage and secretory phenomena a feature of the late premenstrual stage? This would indeed be consistent not only with the histological evidence available, but also with our knowledge of the cyclic production of the specific hormones concerned.

The proliferative changes appear to follow immediately after the short interval or resting phase, and they may be noted as early as the fourteenth day. At this time the blood œstrin level, which had suffered a slight fall after rupture of the follicle, has begun to rise again. The renewal of activity takes the form of nuclear mitosis and cell proliferation. Nuclear displacement by the formation of a clear protoplasmic zone between the basement membrane and the nucleus constitutes another sign of the early premenstrual changes. Incidentally, Schröder appears to regard this as a secretory phenomenon; and this fact, together with the tendency to group the regenerative and proliferative phases together, would probably explain the aforementioned inconsistency.

Proliferative changes are progressive until about eight days before the next menstruation, by which time the glands have increased in size and length and have become convoluted with epithelial processes projecting into the lumina. At the time of onset of these changes the secretion of luteal hormone has only just begun; but within a week or less its specific effect is seen in the "decidual" reaction it provokes as its concentration in the blood rises. These changes, which include not only secretory activity, but stromal development ("the menstrual decidua"), are well known by reason of their further elaboration in the event of pregnancy.

The suggestion of a varying quantitative relationship between the various hormones themselves as the responsible factor in the normal cycle of endometrial changes brings up several interesting points. The concentration of œstrin in the blood, for instance, is constantly rising during the intermenstrual period; but the proliferative changes in the endometrium are not progressive to this extent. This may perhaps be attributed to two factors: first, that a certain amount of the œstrin in the late premenstrual stage is required to inhibit the activity and secretion of the anterior pituitary

hormone, and secondly, that the rising level of luteal hormone tends to inhibit further proliferative changes.

This hypothesis of a quantitative hormonal factor in the determination of the normal endometrial changes is further borne out by a study of the morphological changes noted when there exists an imbalance of the essential hormones. Such a study may be made in the clinico-pathological syndrome known as *metropathia hæmorrhagica*. Here there is clinically a period of amenorrhœa of varying duration, followed by a prolonged period of daily uterine hæmorrhage. The pathological changes are well known: the unilateral follicular cysts in the ovary showing absence of any lutein tissue, the thickened polypoidal endometrium with cystic dilatation of the gland spaces, and the dense stroma, which is not, however, of the "decidual" type.

Whatever the reason for the failure of follicular rupture and *corpus luteum* formation, the fact remains that here we have an example of what happens when the secretion of the œstrogenic hormone is prolonged and unopposed. The secretion of the luteal hormone, which is required to complete the cycle, is absent, and the whole mechanism is thrown out of gear.

The concentration of œstrin in the blood, though maintained over a long period, presumably fails to reach the level required for inhibition of the anterior pituitary hormone, as in the normal cycle; its continued secretion is therefore not impaired.

What, then, causes the final breakdown in the endometrium, and the onset of uterine hæmorrhage? There may be a simple quantitative explanation of this too, for sooner or later the concentration of œstrin in the blood must reach a sufficiently high level to inhibit the activity and secretion of the follicle-stimulating pituitary hormone, even though this may take months.

In the absence of further stimulus to follicular activity the endometrium in turn fails to receive its accustomed stimulation and gives way to its inherent tendency to necrosis and disintegration; thus the characteristic clinical picture is completed by the onset of prolonged uterine hæmorrhage.

This digression may help to prove our assumption; but to push the matter to its logical conclusion it is necessary to correlate the appearance of the endometrium in the postmenstrual and interval phases with the available evidence of the blood hormone levels for the corresponding periods.

In a consideration of the postmenstrual or reparative phase several questions arise. From what we know of the normal healing process of tissues, is there really any need to assume a hormonal basis for this reparative phase? We know, for instance, that complete reepithelialization of both skin and mucous surfaces can develop from islets of epithelium left *in situ* after adjoining tissue has been denuded. Furthermore, the actual amount of follicular hormone being secreted at this stage is comparatively small. May it be, therefore, that the morphological features of the endometrium at

this stage are essentially those of repair, as in any comparable tissue not specifically subjected to hormonal control; and that such effects as are exerted by the follicular hormone at this stage are directed towards maintaining, month after month, its characteristic features?

Or are the reparative changes characteristic of this phase just as much dependent on hormonal control as any other phase of the cycle? In other words, if for some reason a double oophorectomy were performed immediately after the destructive phase, would the endometrium regenerate by its own healing power? Evidence on these points is incomplete, and if in fact we seek an analogy with the phenomenon of menstruation, we realize that there is nothing exactly comparable in the whole range of tissue maintenance and repair in any other part of the body. To be consistent, however, we should assume an hormonal basis for these reparative changes, reserving judgement for the present as to the exact part the hormonal factor plays in determining the morphological changes.

We must also correlate what we know of the endometrial structure during the interval phase with the evidence available of hormone levels over the corresponding period. Here we are dealing with a phase of minimum cellular activity, where regeneration, proliferation and secretory activity do not make themselves evident.

This phase has been described as lasting for a variable period; and this fact may be simply explained if we assume a certain concentration of œstrin as being necessary to initiate the onset of the proliferative phase, which marks the end of the resting phase. The wide range of endocrine activity exhibited in different cases would thus explain the varying length of this interval phase.

The morphological features of the premenstrual phase in relation to the hormonal activity have already been discussed. The last consideration, therefore, is that of the hormonal basis of the final menstrual or destructive phase.

What are the factors which in the absence of conception initiate the disintegration of the menstrual decidua?

Here is an excellent example of synergistic interplay of the various specific hormones. The temporary cessation of ovarian stimulation by the gonadotrophic pituitary hormone, the consequent drop in the concentration of the follicular hormone and the regression of the *corpus luteum*, all combine to bring about the characteristic climax of the cycle.

In the absence of the specific stimuli of the two ovarian hormones it is probable that degenerative changes occur in the lining endothelium of the stromal capillaries and widespread extravasation occurs. Simultaneously disintegration of the superficial epithelium and freeing of the mucous secretion of the glands occur. Although both these degenerative changes have been ascribed to a tryptic ferment, which is said to be present in the menstrual discharge, it is logical to assume that the liberation of this ferment is consequential upon the changes initiated by the sudden cessation of hormonal stimulation. The part played by the luteal hormone at this stage is as dramatic as any; for its continued secretion in the event of pregnancy will, of course, stave off the final destructive phase and elaborate the decidua of pregnancy. Conversely, its absence is largely responsible for the disintegration of the menstrual decidua as well as for the uterine contractions of the menstrual phase, since its characteristic ability to induce a quiescent state of the uterine musculature is no longer available.

The temporary arrest of ovarian stimulation through the anterior pituitary gland brings the cycle to a natural conclusion and avoids the risk of over-stimulation, with its eventual failure of response, such as is seen in certain types of functional amenorrhœa.

The practical application of our knowledge of the hormonal basis of the menstrual cycle is beyond the scope of this paper, as also is the more complex subject of the relationship between the sympathetic nervous system and endocrine activity. Suffice it to say that a proper understanding of this matter is essential if we are to have a full appreciation of the part played by endocrine activity in such conditions as *metropathia hæmorrhagica*, functional amenorrhœa of various types, and certain forms of dysmenorrhœa.

Treatment of these disorders by the appropriate follicular, luteal or gonadotrophic hormone is essentially substitution therapy, inasmuch as we seek to reestablish the correct quantitative endocrine balance. Since this is a constantly changing one throughout the menstrual cycle, rational therapy demands an appreciation of these points, hypothetical though some of them may be.

Reports of Cases.

ANURIA FOLLOWING APPENDICECTOMY.

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I.G., a female, aged thirteen years, was admitted to hospital on April 16, 1938, from Tibooburra, 200 miles north of Broken Hill. She gave a history of generalized abdominal pain, which settled in the right side, of forty-eight hours' duration. She had had a similar attack one month previously.

On examination she looked ill; her tongue was dry and furred. Her temperature was 36·2° C. (97° F.), and the pulse rate was 140 beats per minute. Her breath was offensive. Examination of the abdomen disclosed tenderness in the right iliac fossa. The muscles were on guard in the right lower quadrant. No mass was palpable. The patient voided ten ounces of urine, in which no abnormality was detected.

Appendicectomy was performed 45 minutes after her admission to hospital. Anæsthesia was induced with ethyl chloride and maintained with open ether. The appendix

was acutely inflamed and covered with lymph. There was no evidence of general peritonitis. The appendix was not difficult to remove and the operation occupied a short time only.

On April 17, 1938, thirty-six hours after operation, the patient's temperature was 38·9° C. (102° F.). The pulse rate was 98 per minute. She complained of abdominal pain and said that she had not passed urine; but the record showed that she had passed thirty-one ounces during approximately the previous twenty-four hours.

There were no unusual features during the next seven days. The temperature and pulse rapidly came down to normal and the patient was ready to get up. The urine output and the results of examinations of the urine during this period are given in Table I.

TABLE I.

Date.	Output in Ounces.	Remarks.
April 17, 1938	31	No abnormality detected.
April 18, 1938	19	No abnormality detected.
April 19, 1938	20	Not tested.
April 20, 1938	18	No abnormality detected.
April 21, 1938	36	Not tested.
April 22, 1938	23	No abnormality detected.
April 23, 1938	30	Not tested.

On April 24, 1938, she complained of abdominal pain and voided four ounces of urine, which contained macroscopic blood and blood clots. Two hours later she passed six ounces of urine, heavily blood-stained and containing clots. Her temperature was 37·8° C. (100° F.), and her pulse rate was 110 per minute. She complained of pain in the lower part of the abdomen before passing the urine.

On April 25, 1938, she complained of pain in the back. No urine was passed. Her bladder was catheterized at 8 a.m., but no urine was present. The patient said that she felt quite well and had no pain. Rectal examination revealed no abnormality. An enema was given with good result. X ray examination revealed a large opacity in the right renal area; it was thought to be possibly fæces or calculi.

On April 26, 1938, no urine was passed; the patient's bladder was obviously not full and was not catheterized. One hundred and seventy cubic centimetres (six ounces) of an isotonic solution of sodium sulphate were given slowly intravenously. The blood urea content was 63 milligrammes per 100 cubic centimetres. No œdema was present. At 9 p.m. the patient complained of pain in the lower part of the abdomen.

On April 27, 1938, at 1 a.m., she made the same complaint. Later she complained of pain in the left lumbar region. No urine was passed. At 4 p.m. cystoscopy was carried out; it was begun under local anæsthesia with a cocaine swab in the urethra, but was completed under low spinal anæsthesia induced by the injection of 0·8 cubic centimetre of a 1 in 200 solution of "Percaine". The bladder was normal and the ureteric orifices were normal. No urine was ejected from either ureter. The ureters were catheterised for five centimetres (two inches), but the catheter could not be inserted further. From 6.15 p.m. to 9.15 p.m. the patient was unconscious, with generalised convulsions. At 10 p.m., under anæsthesia induced by ethylene and oxygen, the right kidney was exposed by a Mayo incision. Portion of the twelfth rib was removed. The kidney could not be delivered. The renal pelvis was seen and appeared to contain fluid. The kidney was then decapsulated. The left kidney was exposed and delivered; it was very tense. The pelvis contained 10 cubic centimetres of dark turbid urine obtained by aspiration. The kidney was then decapsulated. Nephrostomy was performed by the passage of a de Pezzer catheter through the kidney into the pelvis. The patient had three severe fits during the hour after operation. She was very restless and semi-comatose during the next sixteen hours, but had no fits. Her condition then rapidly improved. Drainage through the nephrostomy tube began one hour after operation, and five ounces of blood-stained

urine were collected in five hours. During the twenty-four hours after the operation 42 ounces of blood-stained urine drained away; 64 ounces were drained during the next twenty-four hours.

On April 30, 1938, three days after the operation, the patient commenced voiding urine. On May 11, 1938, only one ounce was drained through the tube. On May 12, 1938, the tube was removed. The patient was discharged on May 30, 1938.

Discussion.

The cause of the anuria is not clear. Since the left kidney, on which the nephrostomy was performed, commenced secreting urine a few hours after operation, whereas the right kidney, on which decapsulation only was performed, did not secrete until at least the third day, urine being voided that day, it would appear that nephrostomy was the effective measure and not decapsulation.

In THE MEDICAL JOURNAL OF AUSTRALIA of May 21, 1938, Dr. J. G. Whitaker and Dr. S. Williams reported at a meeting of the Melbourne Pædiatric Society a case of anuria following appendicectomy. Their patient was a girl, aged twelve years, who recovered following the intravenous administration of an isotonic solution of sodium sulphate.

MYASTHENIA GRAVIS AND ITS TREATMENT WITH "PROSTIGMIN" AND BENZEDRINE.

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IN view of the rarity and until recently the hopeless outlook of *myasthenia gravis*, I should like to record the symptoms and progress of a patient who recently came under my care.

Clinical Record.

The patient was a married woman, aged thirty-one years. She complained of difficulty in swallowing, with regurgitation of food through the nose. Indistinct articulation of speech troubled her. She was also unable to approximate the eyelids, and felt a peculiar "stiffness" of the mouth, with lack of flexibility of the lips. Owing to the dysphagia she had lost ten pounds in weight.

These symptoms had appeared quite suddenly late one afternoon twelve months earlier. They were intermittent; but during the three weeks prior to her seeking advice all the symptoms had been worse and more persistent. Bodily fatigue from effort was noticed to augment the symptoms, and the late afternoon was the most troublous time for her. At the time of the first examination breakfast was the only meal that could be taken without regurgitation.

Physical examination revealed the following abnormalities: ptosis of both eyes with inability to approximate the eyelids, lack of mobility of the lips, elevation of the angles of the mouth on smiling, with the typical "nasal snarl". The voice was of the nasal staccato type, and in common with the other defects was made worse by effort (in this instance by talking), to such an extent that in a few minutes the patient became quite inarticulate from the dysarthria. There was no movement of the soft palate.

The facies depicting the diminished ability to close or pucker the eyes and mouth, the motionless and dysarthric speech and peculiar smile, revealed the complete picture. The patellar tendon reflex was typical of the myasthenic reaction, namely, a brisk response falling to no response whatever on repetition.

The history and examination left no doubt as to the diagnosis; but cases in which there are bulbar symptoms only must be differentiated from those of true bulbar paresis.

In *myasthenia gravis*, which was once designated "asthenic bulbar paralysis", the palsies are transient; they are made worse by effort and relieved, at least in part, by rest. This phenomenon occurs in no other disease.

FIGURE I.

The patient, directed to close her eyes, before treatment. Note the inability to approximate the lids.

Spastic and atrophic bulbar paresis have distinctive features of their own, such as spasticity in the former and atrophy and fibrillation in the latter, and they have not this variability. The facial types of muscular dystrophy

FIGURE II.

The patient, directed to close her eyes, fifteen minutes after the intramuscular administration of two cubic centimetres of "Prostigmin". Note the complete apposition of the eyelids.

and *myotonia atrophica* have but a superficial resemblance to myasthenia in the facial appearance. Difficulty may be encountered, however, when myasthenia commences as a unilateral ophthalmoplegia or laryngoplegia, for diagnosis may then be really difficult.

In the early and perhaps less obvious cases the therapeutic test of giving "Prostigmin" is of infinite value. In any case in which there is not an immediate response the validity of the diagnosis must be questioned.

FIGURE III.

The patient, directed to smile, before treatment.

This patient was given two cubic centimetres of "Prostigmin" intramuscularly, and the response was immediate. The accompanying photographs show objectively the patient before and after she received the "Prostigmin"; but the subjective feeling of well-being and relief from fatigue paralysis which the patient experienced was much

FIGURE IV.

The patient, directed to smile, after treatment. Note the animation of the face and the broader expanse of the mouth.

greater than the illustration conveys. She could smile and swallow without difficulty, and as she termed it, "I feel perfectly well now".

The following substances have been tried in the treatment of this patient: "Prostigmin", benzedrine, ephedrine and glycine. The two latter have not helped at all; the two former, very considerably.

The patient was at first given "Prostigmin" by intramuscular injection and orally in tablet form; glycine and ephedrine were tried, but with no response, although some American writers state that they obtain good results with them.

FIGURE V.
The patient, before treatment, directed to pucker her lips. Note her complete inability to do so.

"Prostigmin" administered orally is both effective and safe; 30 milligrammes given orally is approximately as effective as 0.5 milligramme given parenterally. The

FIGURE VI.
The patient, after treatment, directed to pucker her lips. Note the natural response.

response comes on in half an hour, reaches its maximum in one to two hours and wears off in three to four hours. During this period, paretic muscles regain power. The initial dose is one 15-milligramme tablet at four-hourly intervals, usually repeated four times a day. This is often insufficient to maintain muscular efficiency and must be increased up to six to twelve tablets per day. The established maintenance dose in this case is five 15-milligramme tablets per day; one tablet is taken at 6 a.m., 9 a.m., 12.30 p.m., 3 p.m. and 7 p.m. The midday and afternoon tablets are given approximately half an hour before the respective meal, accompanied by one benzedrine tablet. This slightly enhances the action of "Prostigmin". This has enabled the patient to take her meals in complete comfort and she has gained thirteen pounds in weight in twelve weeks. She is feeling greatly improved, and inquired at the last visit as to the desirability of again playing tennis.

Whilst the maintenance dose of "Prostigmin" was being worked out visceral disturbances, such as abdominal pain and a desire to defæcate, occurred. These were controlled by the administration of 0.3 milligramme of atropine sulphate along with the "Prostigmin". With the 75-milligramme daily total dose of "Prostigmin" there are no side-effects.

As to the general care of the patient, she has been warned against excessive exertion and fatigue, and instructed as to the care which must be taken whilst eating. She has also been given phials of "Prostigmin" and taught how to give herself an intramuscular injection should any of the dread pareses (for example, respiratory) occur.

"Prostigmin", whilst it has yielded no curative results, has helped us very considerably in the treatment of this distressing malady. Guanidine is being tried also in the treatment of myasthenia; but none of this substance is procurable in Australia. The dose of guanidine is approximately one gramme per day.

Discussion.

It is a fact that these patients sometimes may die instantly from sudden syncope, whilst on the other hand others have lived for fifteen to twenty years after their disease has been authoritatively diagnosed. The great risk is infection of the upper part of the respiratory tract, especially for patients with bulbar paresis and involvement of the muscles of respiration. This case is recorded purely from the clinical standpoint, and for precision no reference has been made to the pathology or biochemistry of *myasthenia gravis*. It will be of interest to observe the patient in the future, as the oral administration of this therapeutic aid has converted a hopeless condition into one of at least living comfort.

Acknowledgement.

I am indebted to Dr. G. Mason for the photographic reproductions.

Notes on Books, Current Journals and New Appliances.

LEWIS'S LIBRARY CATALOGUE.

H. K. LEWIS AND COMPANY, of Gower Street, London, have issued Part I of a new edition of the catalogue to their medical and scientific lending library.[1] This library, which consists of some 60,000 volumes, is available to medical practitioners who pay an annual subscription. Subscribers abroad are required to pay, in addition to the subscription fee, a deposit amounting to half the annual subscription. They must also pay postage on books borrowed. Part I of the index consists of a list of authors and titles. This book will be useful to medical librarians and others who have to search medical literature for special information.

[1] "Catalogue of Lewis's Medical and Scientific Lending Library. Part I: Authors and Titles"; new edition, revised to the end of 1937. Demy 8vo, pp. 558. Price: 16s. net.

The Medical Journal of Australia

SATURDAY, MAY 13, 1939.

CARCINOMA OF THE STOMACH.

PROBABLY no pathological condition has been discussed more often in these pages than carcinoma of the stomach. Its incidence is so widespread, its diagnosis in the early stages is so obscure and its efficient treatment calls for such judgement, experience and manual dexterity that this is not surprising. The number of papers devoted to the subject in medical journals is great and the task of gathering important facts from them is not inconsiderable. When, therefore, an extensive "collective review" appears—and such a review has recently been made by Frederick Christopher[1]—it should be studied in the hope that information and encouragement, with possibly correction of false ideas, may be obtained from it.

During 1936 the total number of deaths from cancer in the United States of America was 142,613, and 27,241 of these were due to cancer of the stomach and duodenum; practically all of these cancers, we are told, were cancers of the stomach. The mortality rate for cancer of the stomach was 21·1 per 100,000 of population. In Australia during the year 1936, 7,551 persons died of "cancer and other malignant tumours"; of these, 1,738 suffered from cancer of the stomach and duodenum. Further

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[1] *Surgery, Gynecology and Obstetrics*, February 1, 1939 (Number 2).

dissection of these figures is not made in *The Official Year Book of the Commonwealth of Australia,* but it will be obvious that cancer of the stomach takes heavy toll of the people of Australia, as it does in other countries.

The diagnosis of cancer of the stomach has often been mentioned in this journal, but it may be useful to quote from Christopher a statement attributed to Collins, that the diagnosis must be made when the patient appears normal, when there is no palpable tumour, when there is no reduction in the erythrocyte count and hæmoglobin value, and before loss of weight has occurred. This is a counsel of perfection not often attained. Most clinicians will agree that indigestion in a patient over thirty years of age must be regarded seriously, and many will subscribe to the view that carcinoma should be suspected in every person over forty years of age who suffers from a gastric disturbance until the absence of carcinoma has been proved. The clinician is often in a difficult position—he knows that gastric disorder may be due to many conditions other than malignant disease, and he knows that many of them respond rapidly to medical treatment. When, for example, he is treating a patient suffering from a gastric ulcer, he should in ordinary circumstances adopt the practice of most experienced physicians and give the patient the benefit of medical or conservative treatment, firstly because this is the safest course to adopt, and secondly because it is often completely successful. At the same time he must remember that, as Moynihan declared (this is quoted by Christopher), success of the medical treatment in early cases of carcinoma of the stomach is one of the causes of the high mortality of the disease. It is a trite statement that every diagnostic method must be adopted; even so, it must stand. Probably the most important and most helpful method is radiological examination. Christopher points out that Cole believes that a few cancer cells in the stomach wall can cause a "limp in gastric peristalsis" and that a diagnosis based on this finding may be more accurate than one based on the gross appearance of the tumour. Cole claims that by serial radiography he is able to demonstrate the absence of peristalsis or abnormal peristalsis due

to lack of pliability of the gastric wall resulting from infiltration of the submucosa by cancer cells. Ewing has shown that obliteration of the rugæ and fixation of the submucosa constitute early criteria for carcinoma of the stomach. It is disturbing to find that in 400 cases in which operation was performed at the Mayo Clinic, more than half of the growths which were found to be inoperable had not been diagnosed as inoperable by radiological methods. Further, 39 of the growths which had been classed as inoperable by radiological examination were found to be operable. Bloodgood has stated that it is dangerous to conclude by X ray examination that any lesion of the stomach is cancer and is inoperable. "In 58 of McVicar and Daly's (112) cases resection was possible in spite of X ray evidence of inoperability". McVicar and Daly reported that in 30% of cases of carcinoma of the stomach in which resection was carried out, X ray experts were unable to declare that the lesion was malignant. The conclusion of the matter is that radiological examination is only one method of diagnosis, and that even when all methods have been exhausted the judgement and experience of the skilled clinician are of the utmost importance.

Christopher refers in his review to many aspects of the diagnosis problem other than those that have been mentioned. He also gives an account of much written recently on different types of operation for gastric carcinoma. We do not propose to discuss the review further; our object has been to draw attention once more to the extreme difficulty of the subject and to the need for its careful study. Any practitioner who is in any doubt when he has reason to suspect gastric carcinoma should seek the help of a colleague more experienced than himself; and no practitioner is justified in undertaking the treatment of a patient suffering from this dire malady unless he has made a special study of it.

Current Comment.

PULMONARY EMBOLISM.

G. F. Strong has contributed an article on the subject of pulmonary embolism.[1] Sudden occlusion

[1] *The Canadian Medical Association Journal*, February, 1939.

of a branch of the pulmonary artery may, as he points out, be manifested in several ways. A large embolus may occlude a main branch or the bifurcation of the pulmonary artery. In the latter condition the embolus is termed a "saddle embolus". An embolus of lesser magnitude may plug a small artery in the periphery of the lung; sudden pain, cough and hæmoptysis will result. The first of these occurrences may cause dramatically sudden death, as sometimes happens in the second or third week after surgical operation, to the consternation of the surgeon. The second form may also follow operative measures, and is generally not so serious. It may develop also in numerous medical conditions, particularly cardiac disorder, with auricular fibrillation. In the classical picture of pulmonary embolism sudden stabbing pleural pain with hæmoptysis clearly indicates a pulmonary infarct. Strong points out that sudden occlusion of a branch of the pulmonary artery produces a different clinical picture that is not so well understood. In this condition shock and dyspnœa are more obtrusive than pleural pain, cough and hæmoptysis. The condition might readily be confused with coronary thrombosis, and as its management and prognosis are different from those of the latter condition, it requires careful consideration. Strong states that there is a well-recognized cardiac disturbance that follows occlusion of a pulmonary artery, the nature of which must be partly neurogenic. The pulmonary circulation is not affected sufficiently to produce mechanical embarrassment of the right side of the heart. This has been termed *cor pulmonale acutum*. It produces the clinical manifestations of collapse, dyspnœa, tachycardia and cyanosis. When pain is present it is due to the extent and location of pleural implication. Hæmoptysis may be present or absent. Strong considers that the differential diagnosis between coronary thrombosis and *cor pulmonale acutum* must be made after a due consideration of history, age and physical fitness of the patient, as well as of any other evidence of cardiac disorder. Coronary thrombosis generally, but not invariably, occurs in middle-aged subjects who exhibit manifestations of hypertension, arteriosclerosis or angina. Points favouring the diagnosis of pulmonary embolism would be the occurrence of a suggestive catastrophe in a young previously healthy subject who has undergone an abdominal or pelvic operation, especially when inflammation or trauma in the operative field has increased the tendency to a regional phlebitis. In a coronary catastrophe pain is more likely to be the outstanding manifestation, whereas collapse and dyspnœa dominate the picture of pulmonary embolism. Strong considers that an early hæmoptysis is diagnostic of pulmonary embolism. At the same time it must not be forgotten that pulmonary embolism may be a late manifestation of coronary thrombosis. Leucocytosis and pyrexia may occur in both conditions, as may also a friction rub. In coronary thrombosis, however, the rub is synchronous with the heart sounds and is pericardial in origin. In pulmonary

embolism the rub is pleural in origin. It may escape detection in either condition. Possibly the lesion may be differentiated by means of serial electrocardiograms. The usual changes in coronary thrombosis may persist for some weeks or longer, but those described as typical in pulmonary embolism last for only about two days. From a practical standpoint the electrocardiogram is of only limited value, as it is available to hospital patients only, and not every hospital is in possession of the necessary equipment. Even when the apparatus is in the hospital it may persist for some weeks or even possible to obtain a tracing in the acute stage of so critical an illness as that caused by either of these conditions. As Strong remarks, the cardiogram should be secured when possible, but differential diagnosis should be established without such means.

Strong considers that in either of these conditions sufficient morphine should be given to secure for the patient complete relaxation and rest. He suggests that papaverine may be of use in pulmonary embolism, a dose of 30 milligrammes (half a grain) being administered intravenously. He thinks that, when dyspnœa and cyanosis are conspicuous manifestations, oxygen should be exhibited by nasal catheter or, preferably, by the more suitable newer masks. The greatest difference between the management of pulmonary embolism and coronary thrombosis lies, in Strong's opinion, in the duration of time required for rest in bed. In coronary thrombosis the patient must be confined to bed for from six to eight weeks. Such protracted period is unnecessary in pulmonary embolism. In this condition the patient may be allowed to get up much earlier. Pulmonary embolism is generally secondary to some other medical or surgical condition, and the duration of rest in bed is generally determined by the progress of the primary disorder.

Strong insists that prevention is preferable to treatment, but admits that the opportunities for preventive measures are much less in medical conditions than in post-operative states. It is thoroughly recognized that after an operation the early resumption of normal respiratory activity is an effective way of lessening the danger of pulmonary complications. The use of carbon dioxide, either alone or together with oxygen, during the post-anæsthetic period ensures effective ventilation of the lungs. Coughing during this early stage is a valuable measure. Many pulmonary emboli originate in a peripheral venous thrombosis, which is favoured by venous stasis. Accordingly Strong advocates early use of light massage and passive movements of the extremities, with changes in the position of the patient. The routine exhibition of thyreoid gland has been adopted by some surgeons, on the principle that increased circulatory rate may be of assistance in the prevention of circulatory stasis.

The prognosis of pulmonary embolism is invariably serious; Strong refers to a 50% mortality. Amongst the survivors the prognosis is fairly good. This is in direct contrast with coronary thrombosis,

in which the outlook is always uncertain, as many patients succumb to a recurrence of the coronary accident. The surgical patients who survive the initial stage of a pulmonary embolism generally make a complete recovery without much danger of a further attack.

THE NATURE OF THE LESION IN PERNICIOUS ANÆMIA.

SINCE it has been established that pernicious anæmia is in one sense a deficiency disease, but that the deficiency arises from a defect in the function of part of the alimentary system, it is natural that a search for the nature and site of the lesion should be made. One of the leaders in this inquiry supplementary to the work of Castle has been Meulengracht, of Copenhagen, who with his co-workers has proved that the pig's stomach has two totally distinct sections. The fundal portion contains glands which secrete hydrochloric acid and ferments, while the pyloric portion has glands with large clear cells which are histologically distinctive and secrete the anti-anæmic factor. The Brunner's glands of the duodenum also secrete the anti-anæmic factor and are identical in appearance with the pyloric glands. The two latter groups have been named the "pyloric gland organ". Thus the stomach and duodenum contain an organ which is anatomically and functionally distinctive, designed to produce the intrinsic substance necessary for efficient blood formation. It might seem logical to expect that it is atrophy or disease of this pyloric gland organ which causes pernicious anæmia, and to settle this point Meulengracht has undertaken a histological study of this organ in patients suffering from this disease.[1] Although numbers of observers have found that a chronic gastritis is commonly found in persons dying of pernicious anæmia, the pyloric region has been noted as being less affected, and the scanty observations concerning Brunner's glands point to these being little altered. Meulengracht has previously published the results of investigations into the histology of the pyloric organ in pernicious anæmia, and both he and Magnus and Ungley have been surprised at the good state of preservation of the cells of these glands. Further investigations are now published into the histology of the stomach and duodenum in nine cases, eight of which were beyond doubt proved cases of Addisonian anæmia. One of the difficulties of this work is the fixation of the tissue, for it has been found necessary to use intraabdominal injections of formaldehyde immediately after death. The details of the histology may be left to the experts in the subject; it may merely be remarked that a great amount of work has been carried out by numerous investigators to establish what may be regarded as the normal cellular anatomy of the stomach. This

[1] The American Journal of the Medical Sciences, February, 1939.

standard having been fixed, it is now possible to rely on such findings as are published in the paper under present review. The findings, which have already been adumbrated in previous work, are surprising, for the tissues examined showed that intense changes were most pronounced in the fundus region, becoming less and less evident towards the pylorus, while the Brunner's glands of the duodenum appeared quite normal. Meulengracht remarks that he should have expected that the gastric changes would extend well into the pyloric region, thus compromising its action. His summary is arresting and provocative: "I believe that two facts have been established, (1) that the antianæmic factor of the stomach is produced by the pyloric gland organ, but (2) that a histologic investigation shows that the pyloric gland organ is relatively intact in pernicious anæmia." So far as can be proved at present both these statements are true, and the task of reconciling them now remains as a problem for the students of experimental medicine. The writer suggests various possibilities. There may be quantitative changes not yet revealed by qualitative examinations. This does not seem very feasible. Then the functional efficiency of the glands might be impaired without changes being apparent in their anatomical appearance, as judged by the methods at present available. The parallel of diabetes, with its inconstancy of post mortem lesions in the insular tissues of the pancreas, suggests itself. There is some slight evidence that a functional insufficiency may be present, since the total bulk of gastric fluid has been reported as being reduced. Then again, there may be lacking some hormonal stimulus necessary for the full action of the pyloric gland to take place; and finally Meulengracht points out that it is possible that processes in the intestine are wholly or in part responsible.

It is curious how scientific problems which appear at first sight simple become more complex as investigation proceeds. When Whipple and his associates first carried out their work on simple blood regeneration, they little thought how vast would be the ramifications of their research, and for that matter nobody today can prophesy whither this most fascinating work may lead.

ACUTE RHEUMATISM AND SCARLET FEVER.

So much has been heard lately of hæmolytic streptococcal infections that it is somewhat surprising to realize how recently acquired is much of the knowledge now taken for granted. The final proof of the association of the hæmolytic streptococcus with scarlet fever was obtained as late as 1924. For many years after this discovery much work was done in connexion with the specificity of the various strains of hæmolytic streptococcus isolated from different types of infection. No real claim was ever made for a strain peculiar to

puerperal fever, but the epidemiology of scarlet fever and erysipelas were sufficiently distinct to raise the question of specificity. Was there a "Streptococcus scarlatinæ" or a "Streptococcus erysipelatis"? It was difficult to believe that the one strain of hæmolytic streptococci could produce such widely differing syndromes. However, a series of investigations culminating in the work of Griffith in the years 1931 to 1933 showed that this was in fact the case, and it is now well recognized that impetigo, sore throat, tonsillitis, erysipelas, scarlet fever, puerperal fever and other hæmolytic streptococcal infections may be caused by one and the same type of hæmolytic streptococcus. Scott Thomson[1] discusses the relationship of acute rheumatism to the recognized hæmolytic streptococcal infections. He has studied the incidence of scarlet fever, erysipelas and hæmolytic streptococcal puerperal fever in Edinburgh during the years 1931 to 1936; and has also compared the incidence of scarlet fever with that of acute rheumatism in the same city during the years 1928 to 1935. He found that the correlation between the incidence of acute rheumatism and that of scarlet fever was much greater than any correlation between the incidence of the known notifiable hæmolytic streptococcal diseases. He does not make the obvious comment that this association between the incidence of acute rheumatism and that of scarlet fever may be due to the fact that both are influenced by climatic conditions. The facts he records can hardly be regarded as evidence of the association of the hæmolytic streptococcus and acute rheumatism, though the findings of many workers make it seem likely that future researches will add acute rheumatism to the list of hæmolytic streptococcal infections. Thomson observes that in cooler climates the hæmolytic streptococcus is probably responsible for more ill health than any other single organism, with the exception of the tubercle bacillus, and that if acute rheumatism is added to its achievements this organism will have to be considered as one of the major enemies of mankind.

THE HEART VALVES IN ENDOCARDITIS.

In their "Recent Advances in Pathology" Hadfield and Garrod state that the pathogenesis of bacterial endocarditis is not wholly explained in any form of the disease. They state that when a septicæmia due to a virulent pyogenic organism already exists, the lodgement of bacteria on a valve, especially if the valve has been damaged by previous disease, is a process which may easily be pictured. They add, however, that it is in the subacute form, not demonstrably preceded by septicæmia or by any recognizable disturbance, that so much remains to be explained. Two conditions are necessary for the production of this disease; one is the presence

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[1] Edinburgh Medical Journal, October, 1938.

of bacteria in the blood stream and the other is a susceptible condition of the valve. There are workers who hold that the bacteria are brought into the valves as emboli from the coronary circulation. MacCallum rejects this view as much harder to understand or believe than that already mentioned. He states that the coronary circulation could bring the organisms to the line of closure in the mitral and tricuspid valves only rarely, and to the closure line in the pulmonary and aortic valves not at all. Rosenow was one of those who claimed to have produced endocarditis by the intravenous injection into rabbits of large doses of streptococci. He thought that the process was embolic and also applied to it his well-known doctrine of the selective action of organisms for certain body tissues.

W. F. Harper, of the Department of Anatomy of the London Hospital Medical College, has undertaken an anatomical and experimental study which is of considerable interest.[1] Early in his paper he makes the pertinent statement that unless the presence of blood vessels passing well down into the substance of normal valves can be established, they cannot be seriously considered as a primary contributory factor in the pathogenesis of valvular endocarditis. He refers to work carried out by himself and Dow in 1932, when, after an examination of forty human hearts, normal to inspection and from subjects of varying ages without a clinical history of heart disease, they reported that blood vessels were sometimes present in the atrioventricular valve cusps but did not extend into them for more than three millimetres from the line of attachment to the heart wall. He now reports that he has since 1932 examined a further series of one hundred hearts with the same result. In the present investigation Harper has injected with Leichtlosl Berlin blue 1a and mandarin pen black, in 3% and 2% solutions respectively, hearts from 14 persons dead of ulcerative valvular endocarditis and the hearts of 100 rabbits of different breeds. In the fourteen human hearts he found a "fairly complete" vascularization which extended from the base of the valve cusp to the vegetations; many arterioles of large size were observed. In one case in which serial sections were made, evidence of obliteration of vessels near the lesion was found—the vascularity appeared to be in the process of receding or "regressing from" and not growing towards the lesion. No system of blood vessels was found throughout the whole extent of any of the cusps of the heart valves of the rabbits. The vessels usually terminated with the atrial muscle at the bases of the cusps, in a capillary network, but sometimes tiny vascular extensions were associated with prolongations of the atrial muscle into the cusps. The blood vascular pattern of the heart valves of the rabbit thus bears a close resemblance to the normal pattern found in the heart valves of man.

Harper sought to throw some light on the problem by producing experimentally a downgrowth of new vessels in rabbit valves. In order to produce mechanical damage to the valves he injected intravenously a suspension of "aleuronate" in cold sterile normal saline solution. After a three-day interval the injections were repeated every day for seven days. Two groups of animals were killed following these injections after different intervals of time. In two further series more injections were given and the interval of time between injection and death was extended up to twelve weeks. In every instance new vessels were found in the tricuspid valve; the change was more pronounced after a longer than after a shorter period. Harper concludes that the new vessels were "called out" in response to injury of the valvular epithelium by the particulate matter.

In discussing his results Harper points out that the precise nature of the injury to the valves in man is not clearly understood. He thinks that the downgrowth of blood vessels following an injury, while advantageous at the time, undoubtedly lays the valve open to additional infection along these channels. In view of the work of other investigators, suggesting that injury to the valves leads to the development of endocarditis, he has studied the effects of immunization on the heart valves of the rabbit. He promises to publish his observations in a subsequent paper, but states here that they indicate that during the process of immunization the structure of the atrio-ventricular valves, including their vascular content, is materially altered. As far as the question of injury is concerned, it is interesting to note that Muir, in discussing rheumatic endocarditis, states that the relation of the vegetations to the lines of contact of the valve segments is clear evidence that the pressure along these lines on closure of the valves is a determining factor in the disposition of vegetations. Mention should also be made of the work of Wyssokowitsch, quoted by Hadfield and Garrod. Wyssokowitsch perforated the aortic valves by means of a needle introduced through the aortic wall and found that if bacteria were injected into the circulation within the next two days, endocarditis developed at the site of injury to the valve. Grant in large measure confirmed these findings—he produced platelet deposition at the site of perforation. In regard to the promised publication of Harper, it is of interest to recall that Semsroth and Koch in 1929 produced endocarditis following sensitization by injection of casein. Harper's work is of interest chiefly from the anatomical point of view. At the same time it is necessary to remember, as Hadfield and Garrod have emphasized, that the short and acute course of lesions produced in animals bears little resemblance to the condition seen in man—"months or years of predisposition almost certainly precede the disease itself and the course is long". Though this subject might be discussed at much greater length, it is probably well to conclude with Hadfield and Garrod's declaration that there is still much to be done in the study of the patient himself.

[1] Journal of Anatomy, October, 1938.

Abstracts from Current Medical Literature.

PATHOLOGY.

The "Cardiaorta" as an Organ and its Changes in Coronary Sclerosis.

ROBERT NEUMANN (*Virchows Archiv*, December, 1938) aims to show that the present division of the aorta into three parts, namely, *aorta ascendens*, *arcus aortæ* and *aorta descendens*, is not consistent with pathological as well as with anatomical and physiological facts. He points out that the most common site of spontaneous rupture of the aorta is the *aorta ascendens* and the first part of the arcus. *Mesaortitis syphilitica* is either confined to this part or has its most conspicuous lesions there. His endeavours to find an anatomical substrate for this kind of localization were successful. He was able to show that this part of the aorta is not supplied with blood by the usual *vasa vasorum*, but by two arteries hitherto unknown, which spring from the coronary arteries; strictly speaking, they come from the *arteriæ auriculares*, the first branches of the coronary arteries. Neumann has given them the name "*arteriæ cardiaortales dextræ et sinistræ*". Their walls have a special architecture. The intima is a single layer of endothelial cells; then follows a very conspicuous *membrana elastica interna*. The thick muscular layer is quite different from that of the ordinary arteries, in so far as the muscle cells are arranged not circularly but longitudinally. The adventitia is a rather loose network of elastic fibres with a dense ring of elastic fibres just on the border of the media, so that a *lamina elastica externa* is formed. These vessels supply with blood the *aorta ascendens* and the greater half of the *arcus aortæ*, and give the foundation for Neumann's suggestion that this part of the aorta should be considered as an independent organ. He proposes that it should be named "cardiaorta". Many suggestions arise from such a conception: for example, it might be that these arteries play an important part in the development of *mesaortitis syphilitica*. Neumann reports in the second part of his paper another series of examinations he has already made. He examined the *arteriæ cardiaortales* in 22 cases of coronary sclerosis. He found considerable changes in these arteries; but these changes were different from those usually found in the coronary arteries. There was no atheroma and no calcification. An elastosis of the media with atrophy of the muscular tissue, springing up of the *elastica interna*, sometimes densification or disintegration of the *elastica interna* are the most conspicuous changes. Lesions in the cardiaorta are to be found in the majority of these cases. They are localized in the media close to the adventitia, and here submiliary granulomata, submiliary scars and islet-shaped fatty degenerations are seen. Neumann suggests that these lesions are due to the changes in the *arteriæ cardiaortales*.

Cancer Prophylaxis by Cancerogenic Polycyclic Hydrocarbons.

IT has already been shown by K. H. Bauer, in 1937, that small amounts of one of the cancerogenic hydrocarbons (benzpyrene) are able to cure human cancer in a few specially selected cases. Alapy (*Zeitschrift für Krebsforschung*, September, 1938) reports experiments by which he tried to find out if such hydrocarbons were able to prevent the growth of animal graft tumours. He treated mice and rats at first with very small amounts of benzpyrene, methylcholanthrene and 1.2.5.6.-dibenzanthracene, and inoculated them later with various types of highly virulent animal cancers and sarcomata. The result was disappointing. In mice a certain delay in the first development of these tumours was seen; but it was followed by a more rapid growth, so that after eighteen days the tumours in treated and untreated mice were the same size. In rats no effect on the tumour development was seen; in young rats the general development of the body was delayed for weeks. In another paper in the same journal B. Rarci and H. Gummel report similar experiments with the same results.

Sex as a Factor in the Prognosis of Hodgkin's Disease.

E. EPSTEIN (*The American Journal of Cancer*, February, 1939) has collected from the literature two series of cases of Hodgkin's disease. Of the patients, 104 were female and 180 male. Epstein has reviewed their histories for the average survival period—that is, for length of survival period from the onset of the disease to the death of the patient—and for the distribution of the disease in the various decades of life. A previous review of 500 cases had shown that Hodgkin's disease occurred three times as often in men as in women. Of the women, more than 75% lived for more than three years after the appearance of the disease, over 50% for more than five years, and 20% are still living after eight years. Of the men, 50% died before the end of three years, and only about 10% lived for more than five years. There is no considerable difference with regard to age of onset of Hodgkin's disease between the two sexes, but the numbers of patients who die in less than three years are absolutely different in the two sexes. The figures for men show a steady increase with age. Among females there is an increase in the first two decades, then follows a considerable decrease for the next three decades, and then an increase again when sexual activity ceases. Of all the women who develop Hodgkin's disease, 92% between the ages of thirty and fifty years will live for more than three years. From these facts it appears that women have a certain protection against Hodgkin's disease, and Epstein suggests that it is glandular activity which exerts this restraining influence.

The Effect of Thyroxine on the Arteries.

I. VON BALO (*Beiträge für pathologische Anatomie*, February, 1939) refers to former experiments in which he had been able to produce arteriosclerosis of the adrenaline type in rabbits by administering to them ammonium hydroxide in excess. Considerable acidosis is caused, and as the usual adrenaline arteriosclerosis is preceded by acidosis, the question arose whether all arteriosclerosis of the adrenaline type was not due to acidosis. Another way of producing such a type of arteriosclerosis is the injection of thyroxine into rabbits. After one month, 0·5 gramme being injected daily, all the rabbits had very conspicuous arteriosclerosis of this type. Another important change found was considerable destruction of the erythrocytes; their number was reduced from six or seven million to four or five million per cubic millimetre. In the bone marrow degeneration of the nuclei of the normoblasts was found. The carbon dioxide capacity of the blood sank from 60 volumes *per centum* to 30, even to 20 volumes *per centum*. It was noticeable that the development of arteriosclerosis went parallel with the degree of acidosis. The question as to how thyroxine produces acidosis is answered by Balo; he suggests that the destruction of the erythrocytes by the thyroxine causes the acidosis, in the same way as in intoxications with ammonium hydroxide. Another result of Balo's experiments is that small amounts of thyroxine are able to prevent the development of arteriosclerosis caused by adrenaline injection; they further prevent alimentary hypercholesterolæmia and the arteriosclerosis it is possible to produce by feeding animals with cholesterol. The therapeutic use of thyroxine for the prevention of human arteriosclerosis has already been tried; the results are still doubtful. Balo raises the question whether such therapy might not, even if it is successful in preventing the hypercholesterolic type of arteriosclerosis, damage the arteries of man in the same way as it does those of rabbits.

Intestinal Lesions in Congenital Syphilis.

R. D'AUNOY AND B. PEARSON (*Archives of Pathology*, February, 1939) report the histories of three premature negro children with congenital syphilis in whom intestinal lesions were found. Such lesions are relatively uncommon. The process is usually confined to the small intestine and has a special predilection for the last portion of the

ileum. The most common and most characteristic lesion is a raised yellow plate-like band which encircles the bowel. Generalised peritonitis may follow ulceration and perforation of these areas, but may occur in the absence of a frank rupture. Microscopically necrosis of the mucosa and submucosa, miliary syphilomata and abscess-like foci are found. Replacement of the whole bowel wall with fibroblastic tissue follows frequently. Spirochætes could be demonstrated in all three cases.

Lymph Gland Metastases of Sarcoma.

WARREN AND MEYER (*The American Journal of Pathology*, November, 1938) draw attention to the fact that the common saying "Cancers spread by way of the lymphatics, sarcoma by way of the blood stream" is not quite correct. They review the literature and from it and their own observations they come to the conclusion that sarcomata, even if melanosarcomata, lymphosarcomata and related forms are omitted, metastasize in lymph nodes in 7% to 10% of cases. They suggest, therefore, that the dissection of the lymph glands, with a radical operation for the removal of a sarcoma, might be a valuable means of improving the prognosis, even in cases in which a lymphatic metastasis is clinically evident.

MORPHOLOGY.

Localization of Nerve Centres of the Extrinsic Eye Muscles.

SHAFIK ABD-EL-MALEK (*Journal of Anatomy*, July, 1938) gives an account of the oculomotor nucleus of the cat. It is a well-developed nucleus whose subdivisions are indistinctly demonstrable. A paramedian nucleus is missing. The Edinger-Westphal nucleus is clearly seen, one on each side. The central nucleus of Perlia in the cat is concerned with the nerve supply to the medial rectus muscle. The author confirms decussation of the fibres of the oculomotor nerve. He also finds evidence of the fact that most of the fibres from the trochlear nuclei decussate before entering the trochlear nerve.

The Brain of an Australian Aboriginal Girl.

J. L. SHELLSHEAR (*Journal of Anatomy*, January, 1939) describes the brain of a girl, aged twelve years, said to be that of an Australian aboriginal. The brain showed a grouping of primitive features, evidence of ill filling and a lack of development in the higher association areas. The conditions discovered were in harmony with those found in the Australian aboriginal brain generally, and were similar to those found in the brain of Marshall's Bushwoman.

In the occipital region a deep *operculum occipitale* was present on both sides in association with vertical folding of the *area striata*. The transverse occipital sulcus could not be defined. On the medial surface the form of the parieto-occipital fissure was in harmony with an ill development of the precuneus and the superior parietal lobule. In the parietal region the form of the parallel sulcus and its associated branches, together with the form of the intraparietal sulcus, presented a picture in keeping with the primitive pattern of the sulci related to the visual areas, and demonstrated that the pattern of the sulci can be used to indicate the degree of the parietal region. In the frontal region the broken condition of the superior frontal sulcus, the well-formed middle frontal sulcus and the diminutive inferior frontal sulcus were, in the author's opinion, directly comparable with Kappers's description of the endocranial cast of *Homo neanderthalensis*; this revealed a lack of frontal development commensurate with the lack of parietal development. The author states that the description of this brain confirms the account previously given by him of the brain of the Australian aboriginal and forms an adequate summary of that brain.

Changes in Pancreas Produced by Sympathetic and Parasympathetic Stimulation.

M. A. SERGEYEVA (*Anatomical Record*, July, 1938) found that prolonged stimulation with an induction current of the vagus nerves in the cat did not elicit any visible secretion which could be collected from the cannulated main duct of the pancreatic gland. Microscopic investigation of the pancreatic gland, after it had been subjected to prolonged action of the vagus nerves, showed that (a) the acinous cells were almost entirely depleted of secretory granules, and (b) the small ducts were distended with a material stainable with the same dyes as the granules. The introduction of a solution of hydrochloric acid into the duodenum produced a flow of pancreatic juice, but histological examination showed that the discharge of secretory granules from the acinous cells was very slight. Intravenous injection of choline chloride produced changes in the pancreatic gland similar to those brought about by vagal stimulation. There was no discharge of secretory granules from the cells of the pancreas in response to intravenous administration of moderate or of massive doses of adrenaline. The effect of splanchnic stimulation on the acinous tissue of the pancreas was similar to that produced when the suprarenal glands had been removed. Under vagal stimulation or choline administration the discharge of granules from the acinous cells surrounding the islands of Langerhans was apparently slower than from the cells in the other parts of the pancreatic lobules, as shown by

the presence of haloes of unexhausted acinous cells around many of the islands. Changes were observed in the structure of the island tissue as a result of stimulation of the secretory nerves of the pancreas as well as after administration of choline.

Internal Architecture of the Mandible.

H. H. WOOLLARD AND A. HARPMAN (*Journal of Anatomy*, July, 1938) conclude that in primate jaws there is a general uniformity in the internal architecture and that this internal architecture is consistent with the external form of the jaw. There are no qualitative aspects of the internal architecture which have a diagnostic value for the great apes or man. The study of the internal architecture of the jaw suggests that elevation of the condyle above the teeth or down-bending of the face or curvature of the neutral zone and alveolar canal is a primitive primate character.

The Structural Organization of the Cœliac Ganglia.

A. KUNTZ (*Journal of Comparative Neurology*, August, 1938) gives a description of the cœliac ganglia and its connexions, based on degenerative experiments, and submits evidence of the fact that fibres arising in the enteric plexuses effect synapses with cœliac ganglion cells, indicating that gastro-intestinal reflexes may be carried out through the cœliac plexus following its complete functional separation from the central nervous system. The author states that in view of the numbers of synaptic connexions in the cœliac ganglia which persist after degeneration of the splanchnic and vagus nerve fibres, these ganglia must be regarded as reflex centres of considerable functional significance.

Histological Changes in the Vesical Muscle following Section of its Nerves.

O. R. LANGWORTHY AND L. C. KOLB (*Anatomical Record*, July, 1938) state that following section of the preganglionic parasympathetic fibres the smooth muscle of the bladder and urethra undergoes hypertrophy. If the nerves are cut on one side, the hypertrophy is greater on that side. The authors think that this hypertrophy is an effort at compensation. Section of the posterior sacral roots which carry proprioceptive impulses from the vesical muscle abolishes contraction waves and leads to persistent stretching of the muscle, and atrophy of the smooth muscle fibres follows. However, if the sympathetic fibres are cut later in these cases, so that the bladder becomes smaller, attempts at multiplication of fibres appear. Section of the post-ganglionic sympathetic fibres leads to dilatation of the ureters and vaso-dilatation of the blood vessels of the ureters, bladder and urethra.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association and of the Melbourne Pædiatric Society was held at the Children's Hospital, Carlton, on November 16, 1938. The meeting took the form of a series of group demonstrations by members of the honorary medical staff of the Children's Hospital and by members of the Pædiatric Society.

Hepatomegaly in Children.

DR. A. P. DERHAM, DR. HENRY J. SINN and DR. C. WALLACE ROSS arranged a demonstration concerning hepatomegaly in children and showed a series of patients including children with acholuric jaundice, cirrhosis of the liver, splenic anæmia, Banti's syndrome, congenital absence of bile ducts, and hydatid of the liver.

It was emphasized that the liver was normally palpable below the costal margin and that in early life, owing to the wide costal margin, more of the liver was in contact with the anterior abdominal wall. The conditions to be considered if the liver appeared to be displaced downwards were: right pleural effusion; alterations in construction of the lower portion of the chest wall resulting, say, from rickets; cardiac enlargement caused by hypertrophy, by dilatation or by serous effusion; and hepatoptosis as part of a general visceroptosis. The possible causes of hepatomegaly were enumerated as: (a) congested liver in cardiac insufficiency due, for example, to congenital heart malformation or mitral stenosis; (b) fatty degeneration of the liver from such conditions as acute infection; (c) fatty infiltration, obesity or some such condition as tuberculosis; (d) amyloid disease; (e) chronic infections, such as syphilis or tuberculosis; (f) blood diseases, including leuchæmia, familial hæmolytic anæmia (acholuric jaundice), familial *icterus gravis neonatorum* (erythroblastosis of the new-born); (g) cirrhosis of the liver—portal cirrhosis, including toxic cirrhosis, biliary cirrhosis, Banti's syndrome, Wilson's disease, congenital stenosis of bile duct; (h) tumours—primary (hepatoma), secondary (sarcoma, adrenal, metastases in bone), hydatid cyst; (i) abscesses due to such conditions as umbilical or appendiceal sepsis; (j) von Gierke's disease—glycogen storage disease; (k) gargoylism; (l) congenital hæmatoporphynuria; (m) enlargement of the liver of unknown ætiology.

In a discussion of the indications for splenectomy in childhood which arose out of the consideration of the value of splenectomy in the treatment of some of the conditions causing hepatomegaly, it was stated that splenectomy was indicated in congenital familial hæmolytic anæmia (acholuric jaundice), in some cases of essential thrombocytopenic purpura, in Banti's syndrome, in tumours of the spleen, including hydatid infestation, in great enlargement of the spleen, such as that encountered in Gaucher's disease or in von Jaksch's disease, in rupture of the spleen; splenectomy had been carried out for erythroblastosis of the new-born and for Cooley's anæmia in addition to the above.

Juvenile Rheumatism.

DR. H. BOYD GRAHAM, DR. H. L. STOKES, DR. T. E. LOWE, DR. L. E. ROTHSTADT and DR. MILDRED HUTCHINGS demonstrated from patients, charts and pathological specimens some of the problems connected with juvenile rheumatism. They described the work being done and the charts being used in the rheumatic clinic of the hospital. An attempt was being made to conduct the work along the lines in operation in Great Britain, Canada, the United States of America, and elsewhere, but it had not yet been found possible to establish a suitable rheumatic convalescent hospital for the prolonged observation and proper treatment of the patients. In the clinic for out-patients at the hospital, in addition to the usual clinical examina-

tion carried out periodically after discharge of patients from hospital, facilities had been arranged for special investigations, such as blood examination, estimation of erythrocyte sedimentation rate, the taking of electrocardiographic records, and the estimation of the size of the heart and of the outline of its shape by fluoroscopic and other radiological methods, and for expert investigation of dietary and environmental factors. It was reported that the patients registered in the clinic were attending regularly and were missed and followed up if they did not attend. It was expected that it would not be long before the improved service would have a demonstrable effect on the well-being of the patients. The comparative absence of organization of the work for juvenile rheumatic subjects in Victoria, as elsewhere in Australia, was the subject of comment and regret; and the reports of workers under favourable conditions were quoted in support of the urgent necessity for considerable local extension of facilities which would have every prospect of materially improving the prognosis for a large number of sufferers from the rheumatic infections who were in present circumstances a burden to themselves and to the community.

Minor Ailments.

DR. ROBERT SOUTHBY, DR. A. B. McCUTCHEON and DR. N. M. SIMPSON showed a number of children to emphasize the importance of a complete routine clinical examination and careful history-taking when children were brought to the doctor on account of indefinite attacks of malaise, anorexia, lack of energy and "sick turns". They had analysed a large series of such cases and commented on the frequency with which an apparently minor ailment had proved to be due to a much more serious underlying condition. Bronchopneumonia, bronchiectasis and widespread bronchitis and sinusitis had been found in one group of cases; in another, stomatitis, gingivitis, dental caries and alveolar abscess had been discovered. Sore throat and tonsillitis as symptoms had been a guide to the discovery of simple, streptococcal or tuberculous otitis, or to simple or tuberculous adenitis, or even to more serious conditions, such as nephritis or rheumatic infections, such as chorea, growing pains, carditis or arthritis. The complaint of swollen glands had served to point to the existence of syphilis, tuberculosis, leuchæmia or Hodgkin's disease, or had been due to impetigo or pediculosis. Toxic and nutritional anæmias, pyobacilluria or kidney lesions had been unearthed in other cases. Chronic appendicitis, *tabes mesenterica*, threadworm infestation, acidosis, cyclic vomiting, migraine and disturbances associated with pubescence had also been the outcome of comparatively mild initial symptoms.

Neurological Cases.

DR. MOSTYN L. POWELL showed some patients of neurological interest; investigations had been carried out which had led to the correct diagnosis and treatment of such conditions as otitic arachnoiditis with hydrocephalus and intradural blood cyst.

The Early Diagnosis of Whooping-Cough.

DR. STANLEY WILLIAMS arranged a demonstration of the methods of investigation to establish the diagnosis of whooping-cough in the early stages. He referred to the importance in the history of the description of the type of cough and of the fact of contact with proved or suspected whooping-cough. He described how an attack of coughing could be stimulated by means of gentle pressure over the larynx and trachea. He demonstrated the cough plate technique, whereby the Bordet-Gengou organisms could be isolated on a special medium after the patient had coughed onto the plate from a distance of four inches. He showed a specimen of a mouse's lung with the typical lesions of whooping-cough after intranasal inoculation with the specific organisms and that of a normal control mouse by way of contrast. The specimens were supplied from the research department of the Commonwealth Serum Laboratories. Dr. Edgar North performed the intranasal inoculation of a mouse by the method described by Burnet and Timmins.

Congenital Deformities.

DR. H. DOUGLAS STEPHENS and DR. RUSSELL HOWARD showed a large number of patients who were in various stages of the treatment and repair of congenital deformities; included in the series were ten examples of harelip and four of cleft palate. Other deformities were *spina bifida*, talipes of several varieties, hydrocephalus, extroversion of the bladder, the infantile type of *fragilitas ossium* and congenital absence of fibula or of ulna.

Non-Specific Infective Arthritis.

DR. ERIC E. PRICE demonstrated from a series of patients and skiagrams certain points relating to the condition of chronic infective non-specific arthritis in childhood. In discussing the features of non-specific infective monarthritis, Dr. Price emphasized the mildness of symptoms and signs and the radiographic appearances. In four out of six cases there was an antecedent injury followed after a short interval by the insidious development of pain and swelling of a joint with evidence of mild arthritis. Joint movement in all directions was limited only by pain and spasm, but the puffy periarticular swelling was usually tender and sometimes warm, and in joints with a capacious capsule effusion could at times be detected. The subsequent histories of the patients shown illustrated the subdivision into synovial and osseous types, of which the former had the better prognosis for movement. In a purely synovial case no radiographic changes were demonstrable, with the exception of the early decalcification of the articulation; but in the osseous group loss of joint cartilage and later deformation of the bone ends, sclerosis and even fusion might be found. The changes were generalized characteristically; any localization, such as actual bone erosion, was unusual and suggestive of tuberculous disease.

Dr. Price commented on the value of the estimation of the red blood cell sedimentation rate. He said that it usually formed a reliable guide to the activity of the lesion; no relapse had been observed after the rate had fallen to normal. A curve indicative of activity was of value in the exclusion of trauma as an important ætiological factor, but one could not rely on a normal curve for the exclusion of an infective origin in diagnosis.

The essential treatment was immobilizaton in plaster, no weight bearing or other function being permitted. Adequate immobilization should be maintained until evidence of inactivity was obtained, but was seldom necessary for longer than six months. The final result was a painless useful joint, though there might be some permanent loss of movement.

Dr. Price showed three patients with multiple involvement of joints to illustrate the features of non-specific infective polyarthritis. He was prepared to accept all of them as a variety of rheumatoid arthritis. The changes in any one of the joints affected were similar to those of monarthritis, but the disease became generalized, the local lesions were more intense, the course was more prolonged, and the treatment was less effective. The balance appeared to be against the patient, a more severe illness resulting; and quiescence rather than cure had to be the expected outcome with a tendency to relapses. To a great extent the treatment was empirical; one patient had manifested improvement after bone boring; the condition of a second improved after a course of injections of "Solganol B oleosum"; and the third patient was still under treatment at Frankston, being kept at rest in bed with immobilization of the affected joints, and receiving heliotherapy and a liberal diet.

Laboratory Diagnosis of Tuberculosis.

DR. REGINALD WEBSTER gave a demonstration from a variety of pathological specimens and discussed the scope for cultural methods in the laboratory diagnosis of tuberculosis.

Cryptorchidism.

DR. G. NEWMAN MORRIS showed a series of patients to illustrate the results of injection of "Antuitrin S" for cryptorchidism. Of eighteen patients who had been the subject of special investigation after treatment at the Children's Hospital it had been possible to follow the course of events in thirteen. Complete descent had taken place in five of these cases, some descent had occurred in three, and no descent in five. The dosage of "Antuitrin S" had varied, but the plan recommended was to give each week, for from six to eight weeks, two injections each of one cubic centimetre (100 rat units); if a further course was indicated it should be commenced after an interval of three months. Dr. Morris commented that if satisfactory results did not follow the second course of injections, it was probable that some mechanical factor was obstructing the inguinal canal, which could be overcome only by surgical operation. There was a difference in the ages of the members of the groups in which treatment had been successful and unsuccessful. With one exception all the boys in whom descent had occurred were over ten years of age; all those without descent were under ten years of age. The exceptional case was that of a boy of five years with one undescended testicle; after five injections, each of fifty rat units, descent had been noted, and it was probable that in that lad the testes had been retracted into the superficial inguinal pouch mentioned by Denis Brown.

Dr. Morris also said that the presence of an inguinal hernia had been a complicating factor in three out of the five unsuccessful cases, and that apart from some genital hypertrophy no ill effects had been encountered in the series. He had reached certain conclusions, which, on account of the small number of cases, were tentative. "Antuitrin S" would hasten the descent in approximately 60% of cases; the optimal age for that form of treatment was about eleven or twelve years, in order that a normal position for the testes might be obtained before the changes of puberty were advanced. He said that in many instances the testes would descend at puberty without treatment, but it was of advantage to have them in the scrotum earlier, to minimize the likelihood of a failure in spermatogenesis. He added that in his opinion there was no advantage in the much larger dosage recommended in America; if the plan advised by him failed, operative treatment should be carried out before puberty and should be followed by treatment with "Antuitrin S" to encourage full development of the testes.

Surgical Demonstrations.

DR. J. G. WHITAKER demonstrated from a series of patients and skiagrams the results of the surgical treatment of hydatid disease of the kidney, bilateral renal calculus, congenital renal abnormalities, post-operative suppression of urine, compound fractures of the skull, and pyloric stenosis of infancy.

DR. J. B. COLQUHOUN and DR. ELIZABETH McCOMAS showed a series of patients illustrating the results of the surgical treatment of osteomyelitis, septic arthritis and fractures about the elbow joints. They also presented two patients with *coxa vara*, two patients with hemivertebræ, and one with diaphyseal acalasia.

DR. W. R. FORSTER demonstrated from a number of patients the early treatment of deformities of the foot.

DR. JEAN MACNAMARA arranged an instructive and comprehensive demonstration of various methods of splinting in orthopædic conditions.

DR. V. L. COLLINS demonstrated the methods used in the wards of the hospital for the administration of fluids to infants.

The Royal Australasian College of Physicians.

FIRST ANNUAL MEETING.

THE first annual meeting of the Royal Australasian College of Physicians was held in Melbourne on March 23, 24 and 25, 1939. The programme included the annual general meeting of the college, meeting of council, and

three scientific sessions. One of the scientific sessions was held in the Walter and Eliza Hall Institute, the remainder in the building of the Royal Australasian College of Surgeons, by the courtesy of the president and council of that body.

The public meeting was held in the Wilson Hall of the University of Melbourne, in the presence of a very large gathering, which included His Excellency the Governor of Victoria, Lord Huntingfield; the Lieutenant-Governor, Sir Frederick Mann, K.C.M.G.; the Right Honourable R. G. Casey, M.P., representing the Federal Government; the Honourable Sir John Harris, K.B.E., M.L.C., Minister for Public Health, representing the Victorian Government; Sir Hugh Devine, President, and Sir Alan Newton, representing the Royal Australasian College of Surgeons; J. D. G. Medley, Esq., Vice-Chancellor of the University; Sir Lennon Raws, Deputy Chancellor; and a number of other representatives of the university, together with members of the judiciary, benefactors of the college and numerous other distinguished guests and their wives.

Lord Huntingfield was received by the President, Sir Charles Blackburn, and Dr. S. V. Sewell and Dr. C. T. Champion de Crespigny, Vice-Presidents, and escorted to the professorial board room, where a procession was formed.

The councillors and office-bearers of the college, the representatives of the Royal Australasian College of Surgeons, the Chancellor and Vice-Chancellor of the University of Melbourne, the President and His Excellency, the Governor then proceeded to the hall and took up positions on the dais.

Sir Charles Blackburn delivered an introductory address in the following terms.

"Your Excellency, the honour has devolved upon me of welcoming you here tonight and informing you of the great gratification of the fellows and members of this college that its first annual meeting should be held in the presence of so distinguished a representative of His Majesty the King.

"I have great pleasure in welcoming also the Chief Justice of Victoria, Sir Frederick Mann, also the Right Honourable R. G. Casey, representing the Commonwealth Government, the Honourable Sir John Harris, representing the State Government of Victoria, and the Chancellor, Sir John Latham, through whom we tender our thanks to the university for the use of this splendid hall.

"I also wish specially to welcome Sir Hugh Devine and Sir Alan Newton, representing the Royal Australasian College of Surgeons, and the many others who comprise this distinguished gathering.

"Your Excellency, the Royal College of Physicians of Australasia owes a great debt to the citizens of Melbourne, and from its inception the physicians of this city have played the leading part in its development. It is therefore most fitting that the first annual meeting should be held in Melbourne and that the proceedings should open with a short account of the history and purpose of the college.

"Although it is barely twelve months since the college was incorporated, the idea of founding it has been simmering in the minds of physicians both in Australia and in New Zealand ever since the Royal Australasian College of Surgeons was established in 1927.

"It might well be argued that the diffidence and caution of the physician as contrasted with the boldness and enterprise of the surgeon are admirably exemplified by a comparison of the methods adopted by the two groups in founding sister colleges.

"The surgeons saw the need of a college and without further ado brought it into being. The physicians, on the other hand, equally conscious of the need, envisaged and shrank from the difficulties inherent in attempting to collect hastily into a society a number of widely scattered persons with little in common but their medical knowledge. They therefore eagerly welcomed a plan put forward by Dr. Sidney Sewell, of paving the way to the more ambitious project by aiming in the first place in establishing personal contacts between the physicians in the Australian States and New Zealand. Dr. Sewell's proposal had the ardent support of Sir Richard Stawell and resulted in the founda-

tion of the Association of Physicians of Australasia in 1930, with Sir Richard as first president.

"The association had no legal status and was more of the nature of a private club, which met at week-ends from time to time in different cities. The membership was limited and in the first place only the more senior physicians, especially those engaged in undergraduate teaching, were invited to join.

"The association proved most successful and its meetings were most zealously attended, with the result that physicians from widely separated areas came into personal contact and had opportunities of discussing medical problems of common interest. Meanwhile the adoption both in the Australian States and in New Zealand of a policy of establishing a number of new base hospitals was creating an increasing demand for doctors with special training to staff them. Thanks to the activities of the Royal Australasian College of Surgeons, there was little difficulty in selecting suitable men for the surgical specialties, since fellowship of the college could be accepted as a guarantee of a high standard of surgical skill. On the medical side, however, there was no similar uniform standard of efficiency. To provide documentary evidence of special medical knowledge the young physician had to choose between obtaining the doctorate of his university (M.D.) or obtaining some qualification outside Australia—usually the membership of the Royal College of Physicians of London (M.R.C.P.).

"Unfortunately, there is no uniformity in the requirements of the M.D. degree by the various universities. While in some the degree may be obtained solely by examination, others, notably the University of Sydney, rigidly adhere to the mediæval concept of a doctor as primarily writing a thesis; so that to qualify for his doctorate the candidate must in the first place present a thesis indicating research work of outstanding merit. As erudition and practical skill are by no means inseparable companions, this avenue is closed to many excellent clinicians who have no aptitude for research.

"The examination for the M.R.A.C.P., on the other hand, is essentially a practical one, and justifies the holder of this qualification in claiming to be familiar with advanced knowledge in his subject. However, while it is eminently desirable that as many young graduates as possible should travel abroad and obtain such a qualification, the ability to do so must necessarily be contingent upon their financial resources.

"As it was clearly undesirable that medicine—as contrasted with surgery—should become a closer preserve for those who either had a flair for research or sufficient funds to travel abroad, the Council of the Association of Physicians, at a meeting in Adelaide in September, 1934, decided that the time had come to form a college of physicians that could look after the interests of young physicians in the way the College of Surgeons was acting for those interested in surgery.

"A subcommittee was formed to submit proposals to a subsequent meeting, but owing to certain difficulties it was not till May, 1936, that a concrete scheme for the formation of a college modelled on that of the Royal College of Physicians of London was actually adopted and the committee was authorized to prepare a formal constitution. During this period, to the great grief of everyone, the death of Sir Richard Stawell had taken place and the association could no longer look forward to having his wise guidance as first president of the college.

"It would be tedious to traverse in detail the further stages in the constitution of the college, and it will suffice to say that it was formally incorporated under the Companies Act of New South Wales in April of last year.

"While passing lightly over the formalities of this period, it would be ungrateful to omit to refer to the debt the college owes to two of its members, Dr. S. O. Cowen and Dr. J. G. Hayden, who worked unceasingly in preparing the constitution, or to overlook the invaluable assistance rendered by Mr. Harold Walker, a Melbourne solicitor, who gave unsparingly of his time in drafting the material into appropriate legal form.

"Throughout the formative period much encouragement was given by the Council of the Royal College of Physicians of London. In 1936 one of the members of the council, Sir Edmund Spriggs, visited Australia and New Zealand and gave most helpful advice, and in June, 1937, some of our council visiting England were invited to meet the executive of the English college and were gratified to find that both the president, Viscount Dawson, and the registrar, the late Sir Raymond Crawfurd, were fully conversant with the draft constitution of the college and warmly approved of it.

"It was shortly after this meeting that, thanks to the joint mediation of the Commonwealth Government of Australia and the Government of New Zealand, His Majesty the King graciously conferred a Royal title upon the college.

"What will always be a most interesting chapter in the history of the foundation of the college will be that dealing with the establishment of the administrative offices. After the decision was made at the original meeting in Adelaide in 1934 that the headquarters would be most suitably located in Sydney, the problem of financing the erection of a college building received no serious consideration till 1936. In October of that year, however, the matter became one of major interest, when some Melbourne citizens who had heard of the projected college, most generously offered to finance the building of a home for it in Melbourne. Though it seemed almost bordering on madness not to accept such a munificent offer, there were sound reasons for not having both the College of Surgeons and College of Physicians housed in the same city. As the College of Surgeons was in Melbourne, it had been hoped that if the College of Physicians had its home in Sydney a very considerable degree of reciprocity might be arranged between the two bodies both in regard to office accommodation and the use of the buildings when scientific meetings took place—an arrangement that has in fact been since negotiated.

"It was finally decided to delay acceptance of the offer until the possibility of obtaining local support for building in Sydney had been examined. Happily, the support was so liberal, both from the Government of New South Wales and from private citizens, that very soon the Sydney members of the council were able to report that the necessary funds were available, and it was then definitely decided to establish the headquarters of the college in Sydney.

"An original proposal to erect a building on a site generously made available by the University of Sydney was abandoned when it was found possible to secure a more central position by purchasing a building in Macquarie Street, formerly known as the Warrigal Club.

"Owing to certain unforeseen difficulties, the structural alterations necessary to suit the purposes of the college are only now nearing completion. Fortunately it was found practicable to build a meeting hall at the rear of the premises, so that it has been possible to retain the façade and lofty receiving rooms in the original form and thus to preserve virtually intact one of the historic buildings of Sydney, the Warrigal Club. With comparatively little structural alteration this historic building can be made to suit admirably the purposes of the college, and it will thus be preserved. It is a matter of great disappointment that unforeseen delays have prevented its being open for inspection by now.

"Grateful reference may here be made to the fact that shortly before his recent widely mourned death, Mr. A. M. Nicholas, of Melbourne, most generously donated towards a foundation fund a sum of £7,500 that he had planned to spend on the building had it been in Melbourne, and that a similar amount has been given by his brother, Mr. G. R. Nicholas. Moreover, since then we have become indebted to another Melbourne friend of the college, Mr. J. T. Tweddle, who has assigned to the same fund £150 per annum in perpetuity. Such a fund, producing a regular income, is of such inestimable value in carrying out the objects of the college, particularly in subsidising research, that it is earnestly hoped that many others will follow the example set by these benefactors.

"Following the English model, the constitution provides for two types of membership—fellows and members—and lays down that once the college is established entrance to it can be gained only by passing an examination for membership. Four years after their election members become eligible to be elected to fellowship. This, however, is not a right but a privilege that will be granted to those recognized as having a high standard of knowledge and who also confine their practice to what is professionally recognized as one of the branches of pure medicine. In adopting this restrictive clause in regard to fellowship, the practice in vogue in all similar colleges has been followed. It in no sense implies criticism of the practice of combining medicine and surgery, but, on the contrary, aims at providing an opportunity for any practitioner who has acquired advanced knowledge in medicine, to enjoy the privileges of the college whatever the nature of his practice, while reserving fellowship for those who have decided to devote their entire attention to medicine. But for the existence of the Association of Physicians the selection of foundation members might have presented considerable difficulty. As it was, it was a simple matter to offer membership of the association to all eligible physicians and to provide in the constitution that the members of the Association of Physicians at the time of its absorption would be eligible to become foundation fellows of the college. As the vast majority of those trained as physicians in Australia and New Zealand took advantage of this opportunity, the college has started its career with more than 250 fellows. Henceforth, as has already been stated, entrance to the college is only through the portal of the membership examination. As the college was actually incorporated last April, two examinations have already been held, and those candidates who were successful at the second examination are to be presented this evening.

"In the actual management of the college it has been necessary to diverge considerably from the centralized control which has proved suitable for its English prototype serving a compact densely populated area.

"Owing to the great distances separating the two Dominions, and also the capital cities of the various Australian States, it has proved necessary to set up New Zealand and State committees to cooperate with the central governing body, on which each committee has representation.

"While the functions of the Australian State committees are comparatively circumscribed, those of the New Zealand Committee are very much wider; indeed in certain directions it is virtually autonomous. This loose interdominion relationship has been already found to work most satisfactorily, while the common bond of the Dominions in the central governing body has been cemented by the gift from the New Zealand fellows of a presidential chair, from which in future years New Zealand presidents will from time to time direct the destinies of the college.

"Though the college officially came into being in April, 1938, it had been provided in the articles of association that the actual transition from the Association of Physicians should be a gradual process, and it was not till December, 1938, that the college was formally inaugurated in the Great Hall of the University of Sydney by His Excellency the Governor of New South Wales. His Excellency, before delivering his address, read a very gracious message from His Majesty the King and also delivered messages from the Governor-General of Australia and the Governor-General of New Zealand.

"Of the many distinguished guests present, time will only permit of reference to the representatives of sister colleges who delivered messages of greeting: Dr. H. Morley Fletcher, who represented the Royal College of Physicians of London and presented a replica of the famous ceremonial caduceus carried by its presidents; Professor C. G. Lambie, representing the Royal College of Physicians of Edinburgh; Dr. Noble Wiley Jones, representing the American College of Physicians; Sir Hugh Devine, representing the Royal Australasian College of Surgeons.

"In briefly discussing the purpose of the college, I do not propose to adopt the terminological exactitude with which the objects are set out in the articles of association, but to speak in very general terms.

"The primary aim is to foster in every way the scientific study and understanding of disease and to encourage physicians by organized research, clinical observation and intelligent application of the new knowledge constantly being made available, to equip themselves better to render service to the community. With this object in view it is proposed to further in every way the opportunities for post-graduate study for young graduates, especially those unable to avail themselves of such facilities outside Australasia; while the examination for membership of the college is especially planned to enable the young physician to demonstrate that he has availed himself of these opportunities.

"Remembering that it has been well said that when a physician ceases to be a student he dies, the college will carry on scientific intercommunication between its fellows and members. It will continue to hold regular meetings, at which they will meet on equal terms and make personal contacts while taking part in scientific discussions; indeed three such scientific sessions are being held during this present meeting.

"A further object that merits particular mention is to arrange for the delivery of public lectures on medical subjects of general interest, such as that to be given later this evening by Dr. S. A. Smith.

"In the founding of a society with a purely scientific objective and containing in its ranks the leading physicians from two great dominions, it was fully realized that a body was being created that was uniquely fitted to advise upon and cooperate in matters of public health. Provision has therefore been made in the constitution for the council to be available to tender a considered opinion on any medical question of public interest when such advice is sought by government or public bodies. Already services of this kind have been rendered both in Australia and New Zealand, and the council has on request on several occasions nominated representatives of the college to act on committees and advisory boards dealing with medical education and health.

"As the years pass, this function is likely to play an increasingly important part in the usefulness of the college, and in time it may well come to occupy a position comparable with that of the Royal College of Physicians of London, which has long been the trusted advisor of the British Government in regard to all legislation relating to public health.

"Such, then, is the history and purpose of the society whose first birthday you are invited to celebrate tonight. In asking you to wish it God speed, I do so with the greatest confidence that you are encouraging an undertaking destined to minister increasingly to the public weal."

His Excellency the Governor, Lord Huntingfield, then delivered the following address:

"Mr. President and gentlemen, I regard it as a great honour to associate myself to night with the first annual general meeting of such a distinguished body. You, gentlemen, belong to the noblest of all professions. From the earliest times healers of the sick have had the respect and homage of the community. Never was that respect so fully justified as today, when new discoveries and ever-lengthening avenues of research make your studies more and more difficult and your training even more arduous. That the standard of training in Victoria is unexcelled by any in the world must be to you a source of justifiable pride. And nowhere is the appreciation and gratitude shown to physicians greater than in this State. I speak with feeling of that appreciation and gratitude as, were it not for the skill of some of your colleagues in England, I should not be here today and my very brief obituary notice could not have included the title of which I am so proud—Governor of Victoria.

"Here in this favoured land it seems strange that there should be any sick people, yet sick people there

undoubtedly are. I have been very much interested in hearing and reading the views of some medical authorities on the connexion between mind and body in sickness. I realize the truth of their assertions when a few hours of worry, such as the prospect of addressing a learned audience like yourselves, or a fit of bad temper necessitates a double dose of my special vintage of alkaline. But I have heard it on good authority that all kinds of mental maladjustments and conflicts, pushed back into the almost inaccessible regions of our subconscious selves, can and do predispose us to definite physical ills. Especially is this true of the young, and as the young must be our chief concern if we are thinking of the future welfare of our country, it seems to me as a humble layman that expert care and advice for what are called problem children is of the very first importance. If we wish to build well and truly the Australia of our dreams, the welfare of body and mind must go hand in hand; and I feel certain, gentlemen, that that welfare, committed to your charge, rests in safe keeping.

"I am indeed sorry that this is the last opportunity I shall have of meeting you in assembly, but I hope very much that I shall have the pleasure of meeting individually any of you who at any time are visiting the Old Country. My relations, both professional and unprofessional, with your members have been so happy that I shall welcome the chance of renewing them.

"In conclusion, I wish to the Royal Australasian College of Physicians every success in their great and valuable work."

Dr. S. O. Cowen, Censor-in-Chief, presented to the President the Right Honourable R. G. Casey, who addressed the audience on behalf of the Federal Government. In his address Mr. Casey congratulated the college on the progress which it had made, and pointed out that bodies such as these were of the utmost value, not only to the community, both lay and medical, but also to the Government, which was confronted with the most difficult tasks in many matters concerning the physical well-being of Australian people. In particular he referred to the problem of invalid pensioners, whose numbers were increasing so rapidly, and he confidently looked to the medical profession for future guidance in the solution of such difficult political problems. He further said that the Government was sincerely desirous of furthering the ideal of a high standard of national health by some scheme of insurance whose scope, he hoped, would be a wide one.

Dr. Cowen then presented to the President the Honourable Sir John Harris, who, in his address on behalf of the Government of Victoria, stressed the necessity of the maintenance of a high ethical ideal in the practice of medicine and surgery, a subject which his own personal experience had taught him was of the most vital importance to the whole community. He paid tribute to the part which could be played by bodies such as these Royal colleges in maintaining a high standard of service to the community.

The following newly admitted members of the college were then presented to the President by the Censor-in-Chief: Dr. Addie Walker (New South Wales), Dr. R. F. West (South Australia), and Dr. C. W. Adey, Dr. R. C. E. Brodie, Dr. K. B. Burwood, Dr. J. L. Frew, Dr. A. W. M. Hutson, Dr. J. E. Sewell, Dr. A. J. M. Sinclair, Dr. W. McL. Smithers, Dr. A. G. H. Springthorpe and Dr. E. R. Trethewie, of Victoria.

Dr. S. A. Smith delivered an address entitled "The Physician, his Life and Times" (see page 713).

Dr. S. V. Sewell, Vice-President of the Royal Australasian College of Physicians, then proposed a vote of thanks to Dr. S. A. Smith for his address. In expressing his appreciation he referred to the part played in the community by other distinguished members of Dr. Smith's family, in particular the late Sir Grafton Elliot Smith, whose renown as an anthropologist and anatomist was well known. Dr. Sewell recalled the great personal stimulus he had received in his early days in England by even brief contact with a man whose influence had been so great in the

medical scientific world. As an acknowledgement of their indebtedness to Dr. Smith for his scholarly and eloquent contribution to the history of the physician and his place in the community, Dr. Sewell asked the audience to carry a vote of thanks by acclamation.

The meeting was then concluded by the playing of the National Anthem by the organist, Mr. H. C. Hollis, and the procession left the hall.

Post=Graduate Work.

A LIBRARY AT THE PRINCE HENRY HOSPITAL, SYDNEY.

DR. C. J. M. WALTERS, general medical superintendent and chief executive officer of the Prince Henry Hospital, Sydney, has forwarded the following notice of a library service at the hospital.

A library suitable for post-graduate study has been established at the Prince Henry Hospital, Sydney, and the Library Committee is desirous of making the facilities available as widely as possible. At the present time the following services can be provided:

1. A lending library service for all text-books, pamphlets and periodicals in the possession of the library, under the conditions set out in the regulations.

2. The compilation of lists of references on any required medical or surgical topic, from the literature available in Sydney libraries. (No attempt to appraise such lists can be undertaken.)

3. Medical books and periodicals available in certain other libraries may be borrowed by the Prince Henry Hospital Library and assembled there for the convenience of readers. This is made possible by the courtesy of the governing bodies of these libraries and is subject to facilities of transport. It should also be understood that the libraries which thus lend to us will naturally prefer that their books and periodicals should be consulted, when possible, on their own premises.

4. It is hoped soon to provide photostatic copies of any desired articles at a minimal cost.

5. The library will endeavour to supply translations from foreign periodicals at a cost to be quoted.

Proceedings of the Australian Medical Boards.

VICTORIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Act*, 1928, of Victoria, as duly qualified medical practitioners:

Dorney, Paul Laurence, M.B., B.S., 1937 (Univ. Melbourne).

Ray, John, M.B., B.S., 1936 (Univ. Adelaide).

Breheny, Peter Eugene, M.B., B.S., 1939 (Univ. Melbourne).

Knight, Victor Ernest, M.B., B.S., 1939 (Univ. Melbourne).

Strahan, Edward George, M.B., B.S., 1939 (Univ. Melbourne).

Thom, Alexander Lindsay, M.B., B.S., 1939 (Univ. Melbourne).

Godby, Norman Russell, M.B., B.S., 1939 (Univ. Melbourne).

Gooden, John O'Shaughnessy, M.B., B.S., 1939 (Univ. Melbourne).

Finney, Harriet Elizabeth, M.B., B.S., 1939 (Univ. Melbourne).

Pryde, Anthony Machin, M.B., B.S., 1939 (Univ. Melbourne).

Mulvany, Barry Joseph, M.B., B.S., 1939 (Univ. Melbourne).

Macpherson, Douglas William, M.B., B.S., 1939 (Univ. Melbourne).

Grieve, Bruce Walton, M.B., Ch.B., 1936 (Univ. New Zealand).

Wugmejster, Isaak, M.D., 1928 (Genoa).

The following changes of name by deed poll were approved:

Daniel Wajcberg to Daniel Wise.
Mojzesn Zalmen Kokiel to Robert Kiel.
Moses Schneebaum to Moses Snow.
Gisela Schneebaum to Gisela Snow.

QUEENSLAND.

THE undermentioned have been registered, pursuant to the provisions of *The Medical Acts*, 1925 *to* 1935, of Queensland, as duly qualified medical practitioners:

Benson, Henry Gordon, M.B., B.S., 1936 (Univ. Sydney), Cleveland.

Day-Lewis, Alfred Kay, M.R.C.S. (England), L.R.C.P. (London), 1919, Brisbane.

Earnshaw, Herbert Gaylard, M.R.C.S. (England), L.R.C.P. (London), 1936, Brisbane.

Fife, Brenda, M.B., Ch.B., 1934 (Univ. Birmingham), Aramac.

Jackson, Margaret Robina, M.B., B.S., 1937 (Univ. New Zealand), Townsville.

Jones, Raymond Lloyd, M.B., B.S., 1939 (Univ. Sydney), Brisbane.

Nelson, Beatrice Esther, M.B., B.S., 1937 (Univ. New Zealand), Townsville.

Thelander, Charles Eugene, M.B., B.S., 1939 (Univ. Melbourne), Warwick.

Obituary.

RONALD JOHN PARKER.

WE regret to announce the death of Dr. Ronald John Parker, which occurred on April 25, 1939, at Avondale, New Zealand.

GEOFFREY ORR EWING.

WE regret to announce the death of Dr. Geoffrey Orr Ewing, which occurred on April 26, 1939, at Cairo, Egypt.

Notice.

PATHOLOGICAL REPORTS FROM THE CHILDREN'S HOSPITAL, MELBOURNE.

The Committee of the Melbourne Pædiatric Society, impressed with the informative and literary value of the series of twenty articles by Dr. Reginald Webster which have appeared during recent months in THE MEDICAL JOURNAL OF AUSTRALIA, has sponsored the publication of the essays in book form. The book will be of convenient size, in art paper, and attractively bound.

The committee is very desirous that the venture shall be successful, as it believes that the work redounds to the credit of the Children's Hospital. The book will be issued at a price computed to cover expenses only, and the cost will be approximately 8s. 6d. per volume. Readers of this journal are urged to take advantage of this proposal and to send their orders without delay to Dr. J. W. Grieve, the Honorary Secretary of the Melbourne Pædiatric Society, at 12, Collins Street, Melbourne, C.1.

Nominations and Elections.

THE undermentioned has applied for election as a member of the Victorian Branch of the British Medical Association:

Kiel, Robert, M.D. (Milan), Manangatang.

The undermentioned have been elected members of the Victorian Branch of the British Medical Association:

Bell, Joyce Margaret Euphan, M.B., B.S., 1937 (Univ. Melbourne), Royal Melbourne Hospital, Melbourne.

Hadley, John Charles George, M.B., B.S., 1938 (Univ. Melbourne), Infectious Diseases Hospital, Fairfield, N.20.

Wall, Robert, B.Sc., M.B., B.S., 1938 (Univ. Melbourne), Alfred Hospital, Prahran, S.1.

The undermentioned have been elected members of the Queensland Branch of the British Medical Association:

Brookfield, William Melville Will, M.B., B.S., 1937 (Univ. New Zealand), General Hospital, Townsville.

Baumatz, Szaja, M.D., 1926 (Siena), Mental Hospital, Goodna.

Diary for the Month.

MAY 16.—New South Wales Branch, B.M.A.: Ethics Committee.
MAY 17.—Western Australian Branch, B.M.A.: Branch.
MAY 18.—New South Wales Branch, B.M.A.: Clinical Meeting.
MAY 23.—New South Wales Branch, B.M.A.: Medical Politics Committee.
MAY 24.—Victorian Branch, B.M.A.: Council.
MAY 25.—South Australian Branch, B.M.A.: Branch: Listerian Oration.
MAY 25.—New South Wales Branch, B.M.A.: Branch.
MAY 26.—Queensland Branch, B.M.A.: Council.
JUNE 1.—South Australian Branch, B.M.A.: Council.
JUNE 2.—Queensland Branch, B.M.A.: Branch: Joseph Bancroft Memorial Lecture.
JUNE 6.—New South Wales Branch, B.M.A.: Organization and Science Committee.
JUNE 7.—Victorian Branch, B.M.A.: Branch.
JUNE 7.—Western Australian Branch, B.M.A.: Council.

Medical Appointments.

Dr. E. F. L. Laurie has been appointed a Medical Officer in the Office of the Director-General of Public Health of New South Wales.

Dr. I. A. O. Fox has been appointed Out-Patients' Registrar (Adelaide Hospital) in the Department of the Inspector-General of Hospitals of South Australia.

Dr. R. S. Rogers has been appointed Honorary Consulting Psychiatrist to the Mental Hospital, Parkside, Northfield Mental Hospital and Enfield Receiving House, South Australia.

Dr. J. K. Bowler has been appointed Medical Officer of Health to the Wickepin District Road Board, in accordance with the provisions of *The Health Act, 1911-1937*, of Western Australia.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser", pages xx to xxii.

AYR HOSPITALS BOARD, AYR, NORTH QUEENSLAND: Junior Medical Officer.

KOORDA ROAD BOARD, KOORDA, WESTERN AUSTRALIA: Medical Officer.

SURAT DISTRICT HOSPITAL, SURAT, QUEENSLAND: Medical Officer.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phoenix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 178, North Terrace, Adelaide.	All Lodge appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

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